

Thomas Hill
Humphry 1774

his Book

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June y^e 30 1775

E. J. H. Hill

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THO^s HILLS

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of the different Operations taught in this Treatise.

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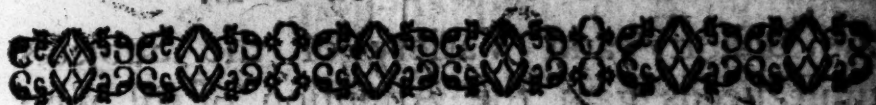
The **THIRD EDITION**, Corrected,
With **LARGE ADDITIONS.**

L O N D O N:

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M DCC LIX.

BY W. G. O. R. D. G. D.
THE THIRD EDITION, CORRECTED.
WITH LARGE ADDITIONS.
LONDON: J. JOHNSON, ST. PAUL'S CHURCH-YARD.
1804.



T H E

P R E F A C E.

THE Instruction of Youth in Schools and Academies, is certainly the most expeditious Method of forming the Minds of young Persons, and of bringing them acquainted with that Kind of Learning which their intended Station and Degree in Life will most require. Those therefore that are blest with affluent Fortunes, and are under the Care of prudent Parents or Guardians, will stand in no Need of the Assistance of such Treatises as this, unless it be to refresh their Memories with what they have formerly been taught, or to look into such Subjects as are quite foreign to the Instruction of those Seminaries of Learning.

But there are many promising Genius's, who, through the Narrowness of their Circumstances, or the Neglect of their Friends, are forced to endeavour to improve their Minds, and regain their lost Time as well as they can. To such as these, I hope the following Sheets will be of great Use; for

The P R E F A C E.

the Solidity and Variety of the Subjects must needs gain the Attention of all who have the least Inclination to cultivate Arts and Sciences.

However I have not confined myself to speculative Matters, such as the abstracted Parts of the Mathematics may appear to be at first Sight; but have shewn their Application to the Measuring all Sorts of Work, to Surveying, Gauging, and Dialling. Those who intend to make any considerable Progress in Mathematical Learning, will find great Assistance in that Part which treats of Algebra, without which no difficult Question can be resolved: And I hope I have laid it down in so plain a Manner, and have said so much about it, that when it is thoroughly understood, the young Student will be able to peruse larger Treatises with Pleasure.

Some Parts of this Work are of universal Use, such as the Directions for Reading and Writing; Instructions for writing Letters, the Manner of addressing Persons of all Ranks, and the various Rules of Arithmetic. As for the rest, which are designed either for Use or Recreation, they may be depended upon to be genuine, and such as will not deceive the Reader when they are put to the Test. The Gardener's Kalendar is very proper to be consulted by those who have large
Gardens,

The P R E F A C E.

Gardens, and are desirous of having every Thing in Perfection in their proper Seasons. Likewise those who have the Care of Horses may learn to distinguish the Diseases which those useful Animals are subject to, and the best and most certain Method of Cure, which is laid down in so plain a Manner, that it is almost impossible for the most Ignorant to make a Mistake.

What is said of Astronomy is of great Use, not only for understanding the System of the Universe, but to explain Geography and Dialling, upon which they in some Measure depend. The general Account of Geography should be well attended to, otherwise it will be impossible to read the Accounts of distant Countries either with Pleasure or Profit.

The Directions for Painting and Colouring relate to such Parts only as may be attained without a Master, and which any may employ themselves about, either for Diversion or otherwise, as their Time or Necessities permit or require. Upon the Whole, no ingenious Person will be at a Loss for a Subject to employ his Thoughts or his Time about, if he has a Relish for solid, useful, and experimental Learning.

But perhaps it may be said, that there are Books of this Kind already which are in every Body's Hands; and therefore you are only

The P R E F A C E.

doing the same Thing over again.---That there are Books published with the same Design is acknowledg'd, but that I have trod in the same Steps with their Authors I must beg Leave to deny; for I have not only treated of the same Subjects with more Accuracy, but have gone much farther than ever they pretended to. For Instance, in Dialling they have only shewn how to make two or three Dials at the most, and in a very inaccurate Manner; whereas I have taught how to project all the useful Dials for every Part of the World; I have likewise drawn them so true, as well as all the rest of the Figures, that they will bear Examination with the Scale and Compasses. But I need not add any more on this Subject, for the best Way to know the Difference will be to compare them together.

The quick Sale of the *former Impressions* hath encouraged me to revise the whole Treatise, and to make such Corrections, Alterations, and Additions as are likely to be most conducive to the Benefit of the Reader; which is the least that could be done by Way of Acknowledgement for the kind Reception this Book hath met with from the Public.

THE CONTENTS.

R	ULES and DIRECTIONS for READING and WRITING	Page 1
	ENGLISH,	
	Of the Alterations of the Sound of Letters, and Consonants that lose their Sound,	2
	Of the Pronunciation of Vowels and Diphthongs, and of Vowels that lose their Sound,	4
	Of the Pronunciation of Letters in foreign and learned Languages,	6
	Of Spelling, Quantity, and Accent,	7
	A Catalogue of Words differently accented,	11
	Of writing and spelling true <i>English</i> , and the different Ways of spelling the same Word,	ibid.
	A List of Words pronounced in a different Manner, according to the different Senses,	15
	A List of Words which differ in Signification by adding e at the End,	16
	A List of Words that are pronounced differently from the Manner in which they are written,	18
	A Table of proper Names written very different from their Pronunciation,	21
	A Table of Words that have the same, or nearly the like Sound, but are different in Signification or Spelling,	22
	Of the Plurals of Nouns, the Denomination of Sexes, and the Preter-Tense and Participles of Verbs,	33
	Of the right placing or joining Words together in a Sentence,	40
	Of Points, Notes, and great Letters used in Printing or Writing,	42
	A Table of Abbreviations or Contractions, wherein one, two, or three Letters stand for one or more Words,	46
I	NSTRuctions in the Art of PENMANSHIP,	48
	The Choice of Pen-knives and Quills for making Pens,	50
	The best Way of making a Pen,	51
	Instructions for sitting at Writing,	53
	Instructions relating to the Round-Hand and the <i>Italian</i> ,	54
	Directions for nibbing the Pen, and sitting to write the Law Hands,	55
	Directions for striking Letters,	56
	Directions for making Figures,	57
	Select Copies in single Lines,	58
	Select moral and divine Sentences, in Prose, first Set,	59
	Select	

The CONTENTS.

Select Copies in easy Verse,	62
Select Sentences, moral and divine, in Prose, second Set,	64
Select Copies, consisting of four, six, or eight Lines,	66
EPISTOLARY WRITING, and select Forms of Address and Bu- siness,	68
From one Cousin to another, and the Answer,	<i>ibid.</i>
From a Brother in Town to a Sister in the Country, com- plaining of Neglect of Writing, with the Answer,	69
A Letter of Reproof from an elder Brother to a younger,	70
From a Guardian to his Ward,	72
From a Tradesman in London to his Country Correspondent,	74
The Answer,	<i>ibid.</i>
From a Servant to his Master in the Country,	75
To a Correspondent,	<i>ibid.</i>
The Answer,	<i>ibid.</i>
Advice to a young Tradesman,	<i>ibid.</i>
Terms of Address to all Sorts of Persons,	78
ARITHMETIC,	81
Numeration,	82
Addition of whole Numbers,	83
Subtraction of whole Numbers,	85
Multiplication of whole Numbers,	87
Division of whole Numbers,	92
COMPOUND ADDITION,	95
Tables of Money, Weights, Measure and Time,	96
Subtraction of several Denominations,	103
Division of divers Denominations,	108
Of FRACTIONS,	109
Reduction of Fractions,	<i>ibid.</i>
Addition and Subtraction of Fractions,	112
Division of Fractions,	113
DECIMAL FRACTIONS,	114
Reduction of Decimals,	115
Decimal Tables,	122
Addition and Subtraction of Decimals,	124
Multiplication of Decimals,	<i>ibid.</i>
Division of Decimals,	127
REDUCTION,	129
The RULE of THREE,	135
The Rule of Three Indirect,	136
The Double Rule of Three,	139
The Double Rule of Three Indirect,	141
RULES of PRACTICE,	142
The EXTRACTION of ROOTS,	143
A Table of Squares and Cubes to 200,	144
EXTRACTION of the CUBE-ROOT,	151
ALGEBRA,	155
Algebraic Signs,	<i>ibid.</i>
Algebraic Addition,	158
Algebraic Subtraction,	160
Algebraic Multiplication,	161
Algebraic Division,	162

The CONTENTS.

	Algebraic Involution and Evolution,	10164
	QUESTIONS in ALGEBRA,	10165
	OF LOGARITHMS, Chords, Sines, Tangents and Secants, and	10174
	their Use,	10182
	PRACTICAL GEOMETRY,	10184
	A Table serving to divide a Line of Chords,	10185
	Of drawing Lines and plain Figures,	10185
	Of the CIRCLES of the SPHERE or GLOBE; and of the fixed	10185
	Stars, Planets, and Comets,	10185
	Of the SPHERE as applied to GEOGRAPHY,	10206
	A Table shewing the Quantity of the Degrees of Longitude in	10207
	every Parallel of Latitude,	10207
	Of the Divisions of the Earth as formed by the Circles of the	10207
	Globe,	10207
	Of the Climates,	10210
	A Table of the Climates and Perallels,	10212
	A Description of the Terrestrial Globe,	10215
	A Table to find the Rising and Setting of the Sun,	10219
	The Terms of Geography explained,	10220
	The general Division of the Earth and Sea,	10222
	Of the principal Isthmus's, Gulphs, Lakes, Straits, and	10224
	Rivers,	10227
	Of the different Religions of the World,	10232
	Of the different Languages, and the Colour of the Inhabitants	10237
	of the World,	10237
	Of Europe,	10242
	Of Great-Britain,	10243
	Of England,	10243
	Of the Principality of Wales,	10243
	Of Scotland,	10243
	Of Ireland,	10245
	OF PLAIN TRIGONOMETRY,	10247
	OF ASTRONOMICAL QUESTIONS,	10255
	OF DIALING,	10264
	To make an Equinoctial Dial,	10265
	To make a Horizontal Dial,	10266
	A Table of the Hour-Distances for Horizontal Dials,	10267
	A Table of the Latitudes of the principal Towns in Great-	10269
	Britain and Ireland,	10270
	To make an Horizontal Dial for the Inhabitants under the	10272
	Equator,	10273
	A Table of the Hour-Distances for Polar, East and West	10274
	Dials,	10276
	To make an East or West Dial,	10278
	To make Vertical Dials,	10282
	A Table of the Hour-Distances for Vertical Dials,	10284
	To make declining Vertical Dials,	10286
	A Table of the Requisites for declining Vertical Dials,	10288
	To make Vertical Dials without a Centre,	10288
	Of colouring Sun-Dials,	10288
	OF MEASURING SUPERFICIES,	10288
	Of measuring Solids,	10296

The CONTENTS.

Of measuring Carpenters Work,	304
Of measuring Bricklayers Work,	305
Of measuring Plasterers Work,	306
Of measuring Joiners Work,	307
Of measuring Painters Work,	308
Of measuring Glasiers Work,	ibid.
Of measuring Masons Work,	309
Of measuring Timber,	310
Of SURVEYING,	316
To survey Land from a Station in the Middle,	318
To take the Plot of a Field by measuring round it,	322
Of measuring Land in common Fields,	325
Of taking Heights and Distances,	ibid.
Of GAUGING of CASKS,	330
The GARDENER's CALENDAR, for January,	334
For February,	338
For March,	342
For April,	346
For May,	349
For June,	352
For July,	355
For August,	357
For September,	360
For October,	363
For November,	366
For December,	367
Of FARRIERY,	368
Directions for Bleeding, Purging, and Clysters,	369
Of Colds,	372
Of Fevers,	373
Of the Pleurisy and Inflammation of the Lungs,	376
Of a Cough and Asthma,	376
Of a Broken Wind,	377
Of a Consumption,	ibid.
Of the Apoplexy, Staggers, Convulsions, Lethargy, Epilepsy,	378
and Palsy,	380
Of the Strangles and Vives,	381
Of the Diseases of the Eyes,	382
Of the Glanders,	ibid.
Of the Gripes,	383
Of the Lax and Scouring,	384
Of Worms and Bots,	ibid.
Of the Yellows or Jaundice,	385
Of the Strangury, Diabetes, and Pissing of Blood,	386
Of Molten-Grease,	ibid.
Of Surfeits, Mange, and being Hide-bound,	387
Of the Farcy,	390
Of Strains in various Parts,	391
Of Ulcers,	392
Of a Bone-Spavin,	393
Of a Curb and Ring-Bone,	ibid.
Of Splents,	394

The CONTENTS.

301	Of the Poll-Evil,	394
303	Of Bruises and Fistulas in the Withers, Warbles on the Back,	395
305	and Sit-Fasts,	396
306	Of Wind Galls, and the Blood-Spavin,	ibid.
308	Of the Mallenders and Sallenders,	397
ibid.	Of the Lampas, Barbs, and Wolves-Teeth,	ibid.
309	Of the Grease,	ibid.
310	Of Scratches, Crown Scabs, and Rat Tails,	398
316	Of the Canker,	ibid.
318	Of Narrow Heels, and Binding of the Hoof,	399
322	Of Sand-Cracks, and Quitters,	400
325	Of wounded Feet from Nails, Gravel, &c.	ibid.
ibid.	Of the Running Thrush or Prush,	401
330	USEFUL RECEIPTS, of various Kinds,	ibid.
334	To make Black Ink,	ibid.
338	To make shining Ink,	ibid.
342	To make London Ink-Powder,	ibid.
346	To make Red Ink,	ibid.
349	Another Way to make Red Ink,	402
352	To write Letters of Secrecy,	ibid.
355	An excellent Cement for broken China and Glasses,	ibid.
357	Another common Cement,	ibid.
360	Another strong Cement for broken China-Ware,	ibid.
363	To join Broken Amber,	ibid.
366	A certain Method to whiten Ivory,	ibid.
367	To make the very best Kind of Varnish,	403
368	A Varnish for all Sorts of Colours,	ibid.
369	To make Lac-Varnish,	ibid.
372	To make a Lacker that looks like Gold,	ibid.
373	To make Fulminating Powder,	404
376	To make a Stone that will produce Fire when wetted,	ibid.
377	To make a Philosophical Tree,	ibid.
ibid.	To make Oil-Cloth for Hat-Cases and other Uses,	405
378	To make fine hard Red Sealing-Wax,	ibid.
380	To make Black Wax,	ibid.
381	To make Balls to take Spots out of Linen, Silk, or Woollen,	ibid.
382	The Method of Quicksilvering Glass-Globes like Looking-	ibid.
383	Glasses,	ibid.
384	To make Strops for setting Razors,	406
385	To dutchify Quills,	ibid.
386	To clarify Quills,	ibid.
387	Lime-Water for the Stone,	407
390	A good Eye-Water,	ibid.
391	To make Tar-Water,	ibid.
392	Balsam for the Rheumatism,	408
393	Balsam for Coughs, Cuts, and Green Wounds,	ibid.
ibid.	A Balsam for the Palsy, and Pain of the Limbs,	ibid.
394	A Decoction for a Looseness,	ibid.
395	A Remedy for an obstinate violent Cough,	ibid.
396	A Remedy for the Piles,	ibid.
397	A Remedy for an Ague,	ibid.
398	Tincture of Aloes,	ibid.
399		The

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EVERY
Young Man's Companion.



RULES and DIRECTIONS for the READING
and WRITING ENGLISH.

Of LETTERS and SYLLABLES.

TO read properly is to express written or printed Words by their usual Sounds: Which Words consist of Letters and Syllables, either one or more; as, *I, that, Table, Improvement.* A Letter is the least Part of a Word, and makes a single Sound, as *a, o, m, n.* A Syllable is a distinct Sound made by one Letter alone, as *a, i, u.* Or by more Letters joined together, as *da, do, ben, the, which.*

Letters are twenty-four in Number, *a, b, c, d, e, f, g, h, i, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z.* To these may be added the Consonants *j,* and *v.* Of these five are Vowels, *a, e, i, o, u;* to which may be added *y.* All the rest are Consonants. A Vowel makes a perfect and distinct Sound of itself: But a Consonant will not make a clear and perfect Sound without joining it to a Vowel. However some make an imperfect Sound, and are called Liquids or Half-Vowels; as *l, m, n, r, f.* The rest are Mutes, or quite silent.

B

I and

Rules and Directions for the

I and *u*, as was observed before, become Consonants, and then change their Shape: The *i* is written thus *j*, and the *u* thus *v*. The *j* Consonant sounds like a soft *g*, as *Jacob*; and the *v* Consonant sounds almost like an *f*, as *vary*, *value*, *reserve*, *Nerve*. The Letter *y* is often used as a Vowel, as in *daily*, *Mystery*. Likewise *w* is used as a Vowel, when it comes after another Vowel, as *draw*, *thaw*, *drown*, *Town*, and then it is pronounced like a *u*.

A *Diphthong* is the joining two Vowels together to make one Sound in the same Syllable, as *ai* in *Praise*, *ee* in *Creed*, *ei* in *seize*, *ie* in *Relief*, *oa* in *Groat*, *oo* in *good*, *ow* in *bow*, *uy* in *buy*. Sometimes two Consonants are joined together; as *fl* in *flame*, *pl* in *Plover*, *gl* in *glow*, *cl* in *Glove*, *kl* in *Klicker*, *mb* in *Lamb*, *mn* in *condemn*, *mp* in *Hemp*, *ms* in *Stems*, *nd* in *command*, *nk* in *Blank*, *pr* in *Praise*, *str* in *strait*, and many more.

A *Triphthong* is when three Vowels are united to make one Sound; as *Beau*, *Beauty*, *quaint*, *View*. Sometimes three Consonants or more may be joined together; as *str* and *ngth* in *Strength*, *phth* in *Phthisick*.



Of the Alteration of the Sound of LETTERS, and of CONSONANTS that lose their Sound.

SOME Consonants have not always the same Sound, but change it according to the Letter they are placed before, which are principally, *c*, *g*, *h*, *k*, *f*, and *t*. *C* most commonly sounds like *k*; but before *e*, *i*, and *y*, it is pronounced like *s*: Like *k* in *Command*, *Country*, *Crown*: Like *f* in *Censure*, *cease*, *Cycle*, *Cypher*, *Cypress*. *G* before *e*, *i* and *y*, is pronounced like an *j* Consonant, as *Gem*, *general*, *generous*, *huge*, *Gesture*, *Ginger*, *Clergy*. The following Words are excepted: *Geer*, *Geese*, *geld*, *Gelding*, *get*, *getting*, *Getter*, *Gewgaws*, *Gibberish*, *Gibble-gabble*, *giddy*, *Giddiness*, *Gift*, *giggle*, *Gilt-head*, *Gimlet*, *gird*, *Girdle*, *Girl*, *Girth*, *give*, *Gizzard*. *C* and *g* are always pronounced hard before a Consonant, except when a Vowel has been omitted in Writing, or is cut off by an Apostrophe, as *advanc'd* for *advanced*.

G before *h* at the End of a Syllable only serves to make it longer; as *high*, *bright*, *light*, *Sight*; except in the following

Reading and Writing English.

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lowing Words, wherein it is pronounced like *f*; as *Cough*, *Trough*, *Chough*, *laugh*, *Laughter*, *rough*, *tough*, *Hough*, and *enough*. *G* before *n* almost loses it Sound; some think it should be pronounced like an *b*, as in *gnaw*, *gnash*, *Gnat*, *Gnomon*, *Gnostics*.

H joined with certain Consonants has a peculiar Sound, as *ch* in *Cheek*, *Cherry*, *Chestnut*; *sh* in *shabby*, *Shaker*, *shame*; *th* in *thaw*, *thank*, *thick*, *thin*; *ph* in *Pheasant*, *Philter*, *Phrase*, where it sounds like an *f*. But we must observe, that there is a Difference in the Sound of *th*, for sometimes it has a hard Sound, as in *this*, *they*; sometimes more soft, as in *bath*, *thin*, *thick*.

K has little or no Sound before an *n*, as in *knock*, *Knee*, *Knight*, *Knot*: Though some think it should be sounded like *b*.

S has sometimes a more hard sound, as in *Kiss*, *Miss*, *Press*, sometimes a more soft, as in *nauseous*, *Noise*, *mus*, *his*, *these*.

Ti, *fi*, and *ci* in the Middle of Words are pronounced like *sh*, as *Vexation*, *precious*, *precision*; except when an *s* or *x* is placed immediately before the *t* or *f*, as in *Combustion*, *celestial*, *Christian*, *Necessity*: As also before the *ed* or *eth* of derivative Words; as *emptied*, *twentieth*, &c. The last are but few. *St* sounds like double *s* in such Words as *these*, *Castle*, *Thistle*, *Whistle*.

B loses its Sound at the End of some Words after *m*, and before *t*, as *Thumb*, *dumb*, *Lamb*, *Comb*, *Debt*, *doubt*, which last are pronounced *det*, *dout*.

C is silent in these Words, *Verdict*, *Viſuals*, *Scene*, *Science*, *Muscle*, *Indict*, *Indictment*.

G is not pronounced at the End of a Word before *n*; as *Sign*, *Reign*, *assign*, *Design*; except *condign*.

H has little or no Sound in these Words, *honour*, *honest*, *Heir*, *Herb*, &c.

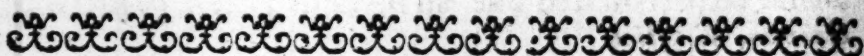
L in common Conversation is never pronounced in *Psalms*, *Calf*, *Half*, *Fault*, *Falk*, *Holborn*, *Salmon*, *Faulcon*.

N is seldom pronounced after *m*; as in *damn*, *condemn*, *Column*, *Autumn*, *linn*, *solemn*, *Hymn*; not after *l* in *Male-Kiln*, *Brick-Kiln*.

P is not sounded in *Receipt*, *empty*, *presumptuous*, *Psalms*, *Sumpter*, *Account*, *Attempt*, *Contempt*, *Psalter*, *sumptuous*, *contemptuous*, *Consumption*, *Symptom*, *Receipt*, and *Redemption*.

S loses its Sound in *Isle*, *Island*, *Viscount*, *Demesns*.

W is not pronounced in *Wrath, write, bewray, wrap, wrong, wreath, Wretch, wrangle, wriggle, Whore, Sword, Swoon, Answer.*



Of the Pronunciation of VOWELS and DIPHTHONGS ; and of VOWELS that lose their Sound.

EVERY Vowel has a long and a short Sound ; besides which, the Letter *a* is pronounced long, short, and broad. Thus *a* is pronounced short in *Cat, Mat, Sprat, Hat, &c.* And long in *Mare, Cane, Share, Mate, prate, &c.* It is sounded broad like *aw*, in *call, Pall, all, Hall, Wall, fall, Malt, bald, scald, &c.* When it comes before *l* in the same Syllable, or when there is double *l* in the Middle of a Word.

E is pronounced short in *Pen, fell, Kæll* ; and long in *these, he, here, even, blaspheme, Theme.* At the End of some Words it serves only to lengthen the Syllable, as *Cane, hate, bite, Fane, Hope, Tune, &c.*

I is short in *Fist, Mill, thick*, and long in *Mile, beguile, Child, thine.* It is pronounced like a short *u* in *first, Bird, Dirt, &c.* In some Words it sounds like a double *e* ; as in *oblige.*

O is short in *not, hop, Rod*, and long in *Nate, Hope, rods.* It sounds like double *o* in *do, to, prove, move, &c.* Like an *i* in *Women, Flaggon,* It is pronounced like a *u* in *Money, conjure, conspire, Attorney, Nonmouth, &c.*

U is short in *Tun, dull, cut, but*, and long in *Tune, Cure, demure, endure.* But like a short *i* in *bury, busy, Business.*

No general Rule can be given with Relation to the Length and Shortness of these Vowels ; however, there is one Rule that seldom fails ; that is, if a single Vowel comes before a single Consonant in the same Syllable it is short ; as *Mat, Pen, thin, hop, Cur.* But if *e* be added after a single Consonant at the End of a Word it is long, as *Mate, Scene, thine, Hope, Cure.* However, Custom has made the following Words short ; *give, live, one, some, come, gone, done, love, Dove.*

Some-

Sometimes one of the Vowels in a Diphthong loses its Sound; and sometimes a single Vowel does the same; for Instance, *a* is not pronounced in *Diamond*; nor *e* before the Liquids *l, m, n, r*; because they have some imperfect Sound of their own, as *Garden, broken, Candle, Castle, Metre, Lucre, Massacre.*

A single *e* is never pronounced at the End of Words, but when there is no other Vowel in the Word, as *the, be, me, she, he, we.* The Reason why *e* is placed at the End of a Word has been mentioned before, namely, to lengthen the Syllable, as *Bath, bathe.* It likewise softens the Sound of *c* and *g*; as *Lac, Lace, Rag, Rage, Spring, Springe.* Besides, it is the Genius of the *English* Language not to end a Word with any of the Vowels except *y*, unless in a few Particles. Thus for *di* is wrote *die*; *Po, Foe*; *Slo, Sloe*; *Tru, True*; *Virtu, Virtue, &c.*

I is not pronounced in *Juice, Venison, Fruit, Cruize, Marriage, Carrage, Business, Cushion, Fashion, Parliament.*

O is not sounded in *People, Feoffee, Bason, Mutton, Jeopardy, Bacon, Crimson.*

A single *u* is always pronounced; but when another Vowel follows it, it is often lost; as in *guard, guilty, Tongue, Plague, guess, Guest.* But not always; as in *Anguish, Languish, Montague.* *U* is always written with *q*, and in some Words it is quite silent, as *Musquet, conquer, Liquor, Masquerade*; and in all Words borrow'd from other Languages that end in *que*, as *Burlesque, oblique, risque, &c.*

The *Diphthongs* in some Words are plainly pronounced; and in others they have a peculiar Sound proper to themselves. Thus *ai* are both pronounced in *Main*; *ou* in *Mouse*; and *ow* in *Cow.* In some Words one Vowel is only pronounced; as *a* in *Hearts*, *e* in *Bread*, *i* in *Guide*, *o* in *Cough*, and *u* in *rough.* It must be owned, that the superfluous Vowels might be omitted, but Custom has made them necessary.

In some Cases, *Diphthongs* have a particular Sound, different from the Vowels of which they are composed, as *ee* in *Weed*, *oo* in *soon.*



Of the Pronunciation of LETTERS in foreign and
learned Languages.

IN Words taken from the Greek and Hebrew *c* is often pronounced like a *k*, as in *Sceptic*, *Scepticism*, *Skeleton*, *Cis*, *Cenchrea*, *Aceldama*.

Ch is pronounced like *k* in Words derived from the Latin, Greek, and Hebrew; as *Christian*, *Chaos*, *Chorus*, *Baruch*, *Stomach*, *Anchor*, *Scheme*, &c. However, *Schism* is to be pronounced *Sism*; *Schismatic*, *Sismatic*; *Drachm*, *Dram*. But the *ch* in this last Word is now generally left out in Writing. Again, we pronounce *Rachel*, *Cherubim*, *Archbishop*, and some others, after the *English* Manner. Custom is divided in many Scripture Names, as *Melchizedek*, *Tychicus*, &c.

In *French* Words *ch* is pronounced like *sh*, as *Chewalter*, *Machine*, *Capuchin*, *Chagrin*; which read *Shevaleer*, *Machine*, *Capushheen*, *Shagreen*.

G is sounded hard in most of the proper Names from foreign Languages, as *Gilboa*, *Gibeon*, *Gilbert*, *Gelderland*, &c. except *Geoffery*, *George*, *Gyles*, *Egypt*; and all *French* Words, where it is sounded soft.

H in foreign Words is generally sounded as in *English*; but in the following proper Names it is quite lost, *Dorothy*, *Esther*, *Anthony*, *Thomas*, *Arthur*, *John*, *Humphrey*; and at the End of Words after a Vowel, as *Shiloh*, *Jeremiah*, *Messiah*.

T in *Greek* and *Hebrew* proper Names keeps its own natural Sound, as *Shealatiel*, *Pelatiab*, *Phaltiel*, *Shephatiab*, *Cottitia*, *Addramittium*, &c. In *Latin* Words it is sounded like *sh* in *English*; for Instance, *Gratian*, *Portius*, &c.

A is almost lost in some foreign Words, as *Bilboa*, *Guinea*, *Pharoah*, *Israel*, and some others.

E is always sounded at the End of *Hebrew* Words, as *Jesse*, *Mamne*; of *Greek*, as *Epitome*, *Candace*, *Phoebe*; and of *Latin*, as *Simile*, *Præmunire*; except where the Termination of the Word is made *English*, as *Eve*, *Tyre*, *Crete*, *Kenite*, *Israelite*, *Ode*, *Scheme*, *Dialogue*, &c. But the Pronunciation of these is only to be learned by observing the Method

Reading and Writing of English.

7

Method of those that are most skill'd in the customary Manner of Speaking.

Diphthongs in the learned Languages are few in Comparison of *English*: There, in Words that are derived from them, the Vowels are generally separated so as to make two distinct Syllables, as *De-ist*, *Po-et*, *Cre-ate*, *Co-operate*, *Je-su-it*, *Ide-a*, *Oce-an*, *Archela-us*, *Co-os*, *Zaebe-us*, *Barne-a*, *Phra-im*, *Abi-exer*, *Zo-ar*, *Gibe-on*.

When double *a* or double *e* are met with in *Hebrew* Names, they are commonly pronounced like a single *a* or *e*, as *Isaac*, *Canaan*, *Balaam*, *Beersheba*, and *Beelzebub*.

We have two *Diphthongs* brought into *English* from the *Latin* Tongue that are often met with, which are *ae* and *ie*, and always sound like the *English* *e*, as *Aeneas*, *Aetna*, *Cæsar*, *Oeconomy*, *Mæcenas*, &c.



Of Spelling, Quantity, and Accent.

SPELLING is the Art of composing Words out of Letters and Syllables, either in Reading or Writing. To perform which, all the Letters that make up the first Syllable are to be put together and pronounced; then put the Letters which make up the second Syllable together, and having pronounced them, join them to the first; and proceed in this Manner till the Word is finished; as for Instance in the Word *Remembrancer*.

R, e,	Re
m, e, m,	Re-mem
b, r, a, n,	Re-mem-bran
c, e, r,	Re-mem-bran-cer.

To know how many Syllables there are in a Word, you must consider how many distinct Sounds there are in it, or how many Pauses or Stops may be made in the pronouncing of it; for there are just so many Syllables in that Word; as in *Pa-per*, *Writ-ing*, are two Syllables, because there are two distinct Sounds; in *Na-ked-ness* there are three Syllables, because three Sounds.

The

The great Rule for Spelling is to divide the Syllables properly, which is done by putting as many Letters to one Syllable as will make a distinct Sound in pronouncing that Word; as *Di-al*, *Con-tempt*, *Mat-ter*, *Sig-ni-fi-ca-ti-on*. When a Consonant comes between two Vowels it must be joined to the latter, as *Pa-per*, *Shā-ker*; except the Letter *x*, which is joined to the Vowel that goes before; as *ex-emplary*, *ex-orbitant*. Observe, that *ph*, *sh*, *th*, are never to be divided, because they are to be reckoned as single Consonants, unless when they are founded apart, as *up-hold*, *Pot-hook*, *Grass-hopper*.

When two Consonants of the same Kind meet together they must be parted, that is, one to the former Syllable, and the other to the latter; as *But-ter*, *Com-mon*, *Mat-ter*, *bor-rid*. Observe also, when several Consonants meet in the Middle of a Word, to place them in the Syllable according to their distinct Sounds, as in the Words *re-store*, *be-speak*, *a-skerw*, *a-squint*, *fa-ble*. But the self-same Consonants must be divided, one to the first Syllable, and the other to the latter, in the following Words; *Mas-ter*, *Whis-per*, *Bas-ket*, *Mus-quet*, *pub-lish*; which is determined by the Pronunciation. Lastly, when two Vowels come together in the Middle of a Word, having two distinct Sounds, they must be divided into two Syllables; as *cru-el*, *cre-ate*, *ru-in*, *No-ab*; though the very same Vowels are *Diphthongs* in *guess*, *Fear*, *Guilt*, *Goat*.

Compound Words are either made up of two distinct Words; as *where-in*, *thank-ful*, *sap-less*, *Cart-horse*, *up-hold*; or a primitive Word and a Preposition; as *en-able*, *un-equal*, *dis-ease*, *re-strain*, *trans-act*, and the like. Derivative Words are made up of one Word and a Syllable coming after it, which is called a Termination; such as *ed* in *paint-ed*, *en* in *gold-en*, *ess* in *Count-ess*, *eth* in *teach-eth*, *er* in *Speaker*, *ing* in *Read-ing*, *ist* in *Latin-ist*, *ous* in *covet-ous*, *ly* in *courteous-ly*.

In pronouncing of compound and derivative Words, the Prepositions and Terminations must be spelt distinct by themselves; except some Words in *Latin*, *Greek*, and *Hebrew*, wherein the primitive Word cannot be distinguished by a mere *English* Scholar, and then he may safely divide them in the common Manner; as *Pro-selyte*, *trans-sient*, *a-dorn*, *In-iniquity*, *Be-thel*: which, according to the Original, should be *Prof-elyte*, *trans-ient*, *ad-orn*, *In-iniquity*, *Be-thel*.

Some

Reading and Writing English.

9

Some of the derivative Words which end in a single Consonant, and double it before the Termination, may be divided according to the common Rule; as *glut*, *glut-th*; *mad*, *mad-der*; *commit*, *commit-ting*. As also such as end in *e*; and lose it before the Termination, as from *requite* come *requi-test*, *requi-teth*, *requi-ter*, *requi-ting*; all which must be spelt by the common Rules.

Besides the dividing of Syllables, every Syllable must have its proper Quantity, and every Word of two or more Syllables its proper Accent.

Quantity is the Distinction of Syllables into long and short. All long Syllables have a Diphthong in them, as *rain*, *break*; or the Vowel has a long or broad Sound; as *stall*, *bate*, *mope*. All other Syllables are short; as *Hat*, *stop*, *Bank*.

The Accent is a particular Stress or Force of Sound that the Voice lays upon any Syllable, whether long or short; as *è* in *open*, *pèn* in *Penny*. It is not always the same in the same Words; for when it signifies an Action, it is accented on the last Syllable, as to *contràct*, to *rebel*; but when it signifies a Thing, the Accent is sometimes transferred to the first. The following Table will be a Guide for such as have not yet duly considered this Matter; wherein the first Word is a Noun, the second a Verb.

To be absent,	To absent.
An Accent,	To accent.
An Attribute,	To attribute.
A Cèment,	To cement.
A Còllèct,	To collect.
A Còmpound,	To compound.
A Cònduct,	To conduct.
The Cònfines,	To confine.
A Cònflìct,	To conflict.
A Còncert,	To concert.
A Còntest,	To contest.
A Còntract,	To contract.
Cònverse,	To converse.
A Cònvèrt,	To convert.
A Dèsert,	To desert.
A Fèrment,	To ferment.
Frèquent,	To frequent.
Incense,	To incense.
An O'bject,	To object.

An

An O'verthrow,	To overthrow.
Prèmises,	To premise.
A Prèsent,	To present.
A Projèct,	To project.
A Rèbel,	To rebel.
A Rècord,	To record.
Rèfuse,	To refuse.
A Subjèct,	To subject.
A Tòrment,	To torment.
An U'nite,	To unite.

Take notice, that Nouns derived from Verbs are accented in the same manner as the Verbs are; as *ferment*, *fermenting*, *collect*, *collector*; *object*, *objection*, *objector*, &c.

Observe likewise, that Compound Words and Derivatives are generally accented like their Primitives; except *prefer*, which has the Accent on the last Syllable, whereas *Prèference* and *prèferable* have it on the first. *Finite* has the Accent on the Syllable *Fi*, but *infinite* on the Syllable *in*, and *Infinity* has it restored to the Syllable *fi* again.

When the Accent is laid on a short Vowel before a single Consonant, it makes the Consonant be pronounced double; as *Màlice*, *Bòdy*, must be sounded like *Mal-licc*, *Bod-dy*.

Some long Words have two or three Accents; as *universal*, *Trànsubstantiation*; but generally one of these Accents is much stronger than the other. But there is no certain Rule for placing these Accents, and therefore the Determination is left to Custom. However, it may be observ'd, that in Words of two Syllables, the Accent is generally laid upon the first; as *Mòrning*, *selfish*: That when the Accent lies on the last Syllable, the Word is almost always a kind of Compound, and the first Syllable is a Preposition; as *complete*, *resòlve*, *prevènt*, *retùrn*: That in Words of three or four Syllables the Accent is seldom laid on the two last Syllables, but on one of the first: And lastly, in Words of six Syllables there are frequently two Accents, one on the first, and the other on the fourth; as *Justification*, *unphilosophical*.

CATALOGUE of some Words that are differently accented,
though the first Column is preferable.

A'cademy,	Acàdemy.
A cceptable,	Accèptable.
A'dmirable,	Admirable.
Advèrtisement,	Advertisèment.
A ttribute,	Attribute.
A'venue,	Avèue.
Cònfessor,	Confèssor.
Còntemptible,	Còntemptible.
Còntrary,	Contràry.
Còntribute,	Còntribute.
Cònversant,	Convèrsant.
Còrollary,	Coròllary.
Corròsive,	Corrosive.
Corruptible,	Còrruptible.
Concupiscence,	Concupiscence.
Dèlectable,	Dèlectable.
Distribute,	Distribute.
Gazètte,	Gàzette.
Oecònomy,	Oèconomy.
Rèfractory,	Refràctory.
Sùccessor,	Succèssor.
Tòward,	Towàrd.
U tensil,	Utensil.

Writing and Spelling true ENGLISH, and the various
Ways of Spelling the same Word.

THERE is no Language whatever so irregular in the
Spelling as a great Part of the *English* Tongue;
therefore it would be a vain Attempt to lay down Rules to
write all Words properly: However, there are many may
be reduced to some Order. The Rules to be observed in
the Performance are as follow.

1. *Ch* at the End of a Word, after a short Vowel, al-
ways takes a *t* before it; as *catch*, *fetch*: Except a few
common Words, as *much*, *such*, *rich*, *which*.

2. A

2. A Vowel which is to sound long before a single Consonant requires an *e* at the End of a Syllable; as *Fate*, *Tune*: But very seldom after a double Consonant or Diphthong; except after the Letter *c* soft, *g* soft, *x*, *s*, *z*, and *v* Consonant; as in *Voice*, *Fence*, *range*, *Axe*, *House*, *rouge*, *carve*, *twelve*.

3. When *g* has a soft Sound before a short Vowel, *d* generally must go before it; as *Badge*, *Hedge*, *Ridge*, *Lodge*, *Cudgel*.

4. When *g* is sounded hard after a long Vowel in the End of a Word, *ue* must follow it; as *vague*, *Plague*, *Catalogue*, *Intrigue*.

5. *Gh* is written instead of *g* in *Ghost*; and *gu* to render the *g* hard, as in *guess*, *Guest*, *guard*, *Guile*, *Guilt*, *Guinea*, *Guide*, *Guise*, *beguile*, *disguise*, *guilty*, &c.

6. *K* at the End of a Word after a short Vowel always takes *c* before it; as *Duck*, *crack*, *knock*, *sick*, *Neck*, &c.

7. A double *l* is always used at the End of Words of one Syllable after a single Vowel; as *all*, *call*, *smell*, *fill*, *roll*, *full*.

8. Double *s* is generally used at the End of a Word after a Vowel that sounds short; as *pass*, *Goodness*, *Ripeness*, *Fatness*, &c. Except a few common Words of one Syllable; as *as*, *is*, *this*, *yes*, *was*, *us*, *thus*. Except also when *s* or *es* is added to the Word; as *Horse*, *Horses*, *Ass*, *Asses*, *Kiss*, *Kisses*, *suppose*, *supposes*.

9. A long *f* is never used at the End of a Word, either in Writing or Printing.

10. The Sound *us* at the End of a Word of more than one Syllable, in Words purely *English*, is written *ous*; as *righteous*, *cautious*, &c.

Though there is but one Way of spelling Words truly, yet we may observe some Variations in good Authors, which it will be worth while to mention. Thus *in* is changed for *en* in the Beginning of a Word; as *ingage*, *engage*; *inquire*, *enquire*; *indanger*, *endanger*; *indure*, *endure*; *intangle*, *entangle*. *Im* is changed into *em*; as *imploy*, *employ*; *imbattle*, *embattle*; *imbezzle*, *embezzle*; *imbark*, *embark*.

K may be left out after *c* in Words borrowed from the *Latin* or *Greek*; as *publick*, *public*; *Musick*, *Music*; *Logic*, *Logic*; *Physick*, *Physic*; *Sceptick*, *Sceptic*.

Some

Some turn *oa* Diphthong into a long *o* and *e* final; as for *Coal*, *Cole*; *Clak*, *Cloke*; *Smoak*, *Smoke*; *groan*, *grone*; *Shoar*, *Shore*. Or is sometimes written for *our*; as *Tumour*, *Tumor*; *Colour*, *Color*; *Honour*, *Honor*; *Favour*, *Favor*; *Conquerour*, *Conqueror*.

Ph is often changed into *f*; as *Phansy*, *Fancy*; *Phanatic*, *Fanatic*; *prophane*, *profane*, &c.

Que is changed into *k* or *ck*; as *Barque*, *Bark*; *Traf-fique*, *Traffick*; *Masque*, *Mask*; *Flasque*, *Flask*; *Relique*, *Relick*, &c.

Re or *er* is written indifferently in these Words; *Theatre*, *Theater*; *Metre*, *Meter*; *Centre*, *Center*; *Sepulchre*, *Sepulcher*. *S* is sometimes changed into *z*; as *Rasor*, *Razor*; *Scissors*, *Scizzors*; *Losenge*, *Lozenge*; *Enterprise*, *Enterprize*, &c. Sometimes *c* is improperly wrote instead of *s* in the following Words; *dispence*, *Suspence*, *Sence*, *Recompence*, *Pretence*, &c. which should be *dispense*, *Suspense*, *Sense*, *Recompense*, *Pretense*, &c.

Ti and *ci* are written indifferently in these Words; *an-tient*, *vitious*, *gratious*, *pretious*, *spatious*, &c. *ancient*, *vici-ous*, *gracious*, *precious*, *spacious*, &c. Though the last Way is most common.

Some take *ugh* from *though* and *through* by an Apof-trophe, thus, *tho'*, *thro'*. And sometimes *ugh* is changed into *w*; as *plough*, *plow*; *enough*, *enow*; *Bough*, *Bow*; *thorough*, *thorow*; *Yough*, *Yew*. But *enough* is more properly spoken of Quantity, as, *there is Wine enough*; *enow* of Number, as, *there are enow*.

After all, there are some Words which are difficult to be brought under any Rule, and therefore it was thought proper to bring them into one View in the following
T A B L E.

Accrew, accrue.
Apricot, Apricock.
Account, Accompt.
Ambassador, Embassador.
Alembick, Limbeck.
Ancle, Ankle.
Accessary, accessory.
Alom, Allum, Alum.
Acrostick, Acrostich.
Alarm, Alarum.

Atchieve, achieve.
Bachelor, Batchelour.
Bisket, Biscuit.
Burden, Burthen.
Becken, Beckon.
Bethlehem, Bethlem, Bed-lam.
Briar, Brier.
Balk, baulk.
Buxom, bucksome.

Blood, Bloud.	Felon, Fellon.
Cabbage, Cabbidge.	Fancy, Phancy, Phantasy.
Carrabine, Carbine.	Faulcon, Falcon.
Centry, Sentry, Sentinel.	Forehead, Forhead.
Cefs, sefs, affefs.	Fane, Vane.
Carret, Carrot, Carot.	Fan, Van.
Camelot, Camlet.	Farther, further.
Chace, Chafe.	Floud, Flood.
Chaldron, Chauldron.	Flea, flay, <i>to flay</i> .
Caldron, Cauldron.	Fraight, Freight.
Chear, Cheer.	Foreign, forreign.
Chequer, Checker.	Gray, grey.
Choir, Quire.	Gage, gauge.
Clark, Clerk.	Gulph, Gulf.
Countrey, Country.	Gantlet, Gauntlet.
●yon, Scyon.	Graff, Graft.
Glyster, Glyfter.	Gaol, Jail.
Cyder, Sider.	Gaoler, Jailer.
Chamois, Shammy, <i>Gloves</i> .	Gill, Jill.
Clothe, Cloathe.	Guiney, Guinea.
Choofe, chufe.	Ghefs, guefs.
Connexion, Connection.	Grandure, Grandeur.
Clod, Clot.	Hainous, heinous.
Crowd, Croud.	Head-ake, Head-ach.
Colledge, College.	Halfer, Hawfer.
Compleat, complete.	Hiccup, Hiccough.
Cofen, cozen, <i>to cheat</i> .	Hanch, Haunch.
Coufen, Cousin.	Houfhold, Houfe-hold.
Curds, Cruds.	Hearfe, Herfe.
Cruise, cruize.	Hatchment, Atchievement.
Counfellow, Councillor.	Julep, Julap.
Damsel, Damofel.	Impofthume, Apoftem.
Damfin, Damfon, Dama- fcene.	Jeffamine, Jeffemin.
Demeans, Demefnes.	Indict, Indite.
Desert, Defart.	Idiot, Idiot.
Daign, deign.	Lanch, launch.
Dram, Drachm.	Lackey, Lacquay.
Eilet, Oilet <i>Holes</i> .	Landrefs, Laundrefs.
Enfign, Encien.	Least, left.
Extasy, Ecstasy.	Lemon, Lemmon.
Emerods, Hemorrhoids.	Leafure, Leifure.
Extreme, Extream.	Loath, lothe.
	Leaver, Lever.

Lantern, Lanthorn.
 Landscape, Landskip.
 Licquorice, Liquorice.
 Metal, Mettle.
 Murder, Murther.
 Manteau, Mantua.
 Meer, mere.
 Penny, Penny.
 Perswade, persuade.
 Primrose, Primrose.
 Pigeon, Pidgeon.
 Pretense, Pretence.
 Privilege, Priviledge.
 Pursue, persue.
 Periwig, Peruque.
 Profane, prophane.
 Porridge, Pottage.
 Portmanteau, Portmantle.
 Plat, or Plot, of Ground.
 Plaister, Plaster.
 Poppet, Puppet.
 Phrensy, Frenzy.
 Public, Publick.
 Quoit, Coit.
 Quoif, Coif.
 Quoil, coil.
 Quinsey, Squinancy.
 Reflexion, Reflection.
 Rhyme, Ryhm.
 Ribbon, Ribband.
 Ruin, Ruine.
 Receipt, Receit.
 Satten, Sattin.
 Sence, Sence.
 Skeleton, Skeleton.
 Shew, Show.
 Scritoir, Escritoire.
 Surgeon, Chirurgion.

Sexton, Sacristan.
 Scutcheon, Escutcheon.
 Sparrowgrass, Asparagus.
 Squire, Esquire.
 Scimeter, Cymiter.
 Shooe, Shoe.
 Sphere, Sphear.
 Santer, Saunter.
 Steddy, Steady.
 Sive, Sieve.
 Sithe, Sythe, Scythe.
 Strait, Straight.
 Solder, Sodder.
 Scrue, Screw, Skrew.
 Skreen, Screen.
 Suddain, Sudden.
 Skain, Skean, of Thre.
 Soverain, Sovereign, Sove-
 reign.
 Stirrop, Stirrup.
 Subtil, subtle.
 Sergeant, Serjeant.
 Supream, Supreme.
 Sprain, Strain.
 Spittal, Spittle, from Hof-
 pital.
 Taffety, Taffeta.
 Teize, teaze.
 Terras, Terrace.
 Troop, Troup.
 Tun, Ton, Tunn.
 Vellom, Vellam, Vellum.
 Vicaridge, Vicarage.
 Veil, Vail.
 Vial, Phial.
 Walst, Waste.
 Wrack, Wreck.

A LIST of Words that are pronounced in a different Manner
 according to their different Senses.

An Abuse, or Injury.

To abuse, or do an Injury.

A Bow, to shoot.

To bow, or bend.

Can't, for cannot.
 Cant, *unintelligible Words.*
 Close, or near.
 To close, or shut, or end.
 Crowd, or Throng.
 Crow'd, or did crow.
 Human, like a Man.
 Humane, or kind.
 Gallant, brave.
 A Gallant, a Suitor or
 Courtier.
 Job, a Name.
 Job, of Work.
 Lead, a Metal.
 To lead, or guide.
 A Minute, Part of an Hour.

Minute, or small.
 Muse, to meditate.
 Muse, one of the nine Muses.
 Precédent, going before.
 Prècedent, or Pattern.
 To read a Book.
 I have read.
 Sow, an Animal.
 To sow Corn.
 To tear in Pieces.
 A Tear, in Weeping.
 Use, or Interest.
 To use, or employ.
 Won't, will not.
 Wont, or accustomed.

*A LIST of Words which differ in Signification by adding
 an e at the End.*

Bad, naught.
 Bade, commanded.
 Ban, a Curse.
 Bane, Ruin.
 Bar, a Hindrance.
 Bare, naked.
 Bath, to go into.
 Bathe, to wash.
 Bit, a small Piece.
 Bite with the Teeth.
 Breath, Air.
 Breathe, to take Air.
 Cag of Brandy.
 Cage for Birds.
 Can, to be able.
 Cane, a Staff.
 Cap for the Head.
 Cape of a Coat.
 Chin, Part of the Face.
 Chine of Bacon.
 Cloth, Linen or Woollen.
 Clothe, or cloathe, to cover
 with Clothes.

Cub, a Bear's Whelp.
 Cube, a Die.
 Cur, a Dog.
 Cure, to heal.
 Dam, to stop Water.
 Dame, a Lady.
 Demur, to delay.
 Demure, modest.
 Din, Noise.
 Dine, to eat a Dinner.
 Divers, many.
 Diverse, different.
 Fat Meat.
 Fate, Destiny.
 Fan with Wind.
 Fane, a Weathercock.
 Fin of a Fish.
 Fine Weather.
 Fir, a Tree.
 Fire, that burns.
 Flam, a pretended Story.
 Flame of Fire.
 Gat, did get.

Gate,

Gate, a Door.
 Hast, thou hast.
 Haste, Speed.
 Her, she.
 Here, in this Place.
 Hop, a bitter Herb.
 Hope, to expect.
 Hug, to embrace.
 Huge, very big.
 Kin, Relation.
 Kine, Cows.
 Lad, a Boy.
 Lade, to take up Water.
 Lath, for Tiles.
 Lathe, for Turners.
 Loth, unwilling.
 Loathe, to dislike.
 Mad, distracted.
 Made, done.
 Man, in Stature.
 Mane of a Horse.
 Mar, to spoil.
 Mare, a Beast.
 Mat, to tread on.
 Mate, a Companion.
 Met, come together.
 Mete, to Measure.
 Mop, to wash with.
 Mope, to be dull.
 Nod, with the Head.
 Node, a Knot.
 Not, no.
 Note, to observe; Note of
 Hand.
 On, upon.
 One, Unit.
 Pan of Earth.
 Pane of Glass.
 Past, gone.
 Paste, Dough.
 Past, seasonable.
 Paste, the Head.
 Pin, to dress with.

Pine, to languish.
 Plat of Ground.
 Plate of Metal.
 Plum, a Fruit.
 Plume of Feathers.
 Quit, to leave.
 Quite, altogether.
 Rag of Cloth.
 Rage, Fury.
 Rat, an Animal.
 Rate, Price.
 Rid, deliver.
 Ride on Horseback.
 Rip, to tear.
 Ripe, at Maturity.
 Rob on the Highway.
 Robe, a Gown.
 Rod, to whip with.
 Rode, did ride.
 Rot, to consume.
 Rote, to talk without Know-
 ledge.
 Sat, did sit.
 Sate, to cloy.
 Scar of a Wound.
 Scare, to affright.
 Scrap, a Bit.
 Scrape with a Knife.
 Sever, to divide.
 Severe, cruel.
 Sham, a Pretence.
 Shame, Disgrace.
 Shin of the Leg.
 Shine, to look bright.
 Sin, a Fault.
 Sine in Geometry.
 Sing a Song.
 Singe, to burn.
 Sir, Master.
 Sire, Father.
 Sooth, Truth.
 Soothe, to flatter.
 Sop of Bread.

Sope, to wash with.
 Spit, to roast with.
 Spite, Malice.
 Stag, a Deer.
 Stage, to stand on.
 Star in the Sky.
 Stare, to gaze.
 Strip, to uncover.
 Stripe, a Blow.
 Swing to and fro.
 Swinge, to belabour.
 Them, those.
 Theme, a Subject.
 Thin, not thick.
 Thine, of thee.
 Trip, to walk nimbly.
 Tripe, the Inwards.
 Tub of Water.
 Tube, a Pipe.

Tun in Weight.
 Tune in Musick.
 Twin, one of two.
 Twine, to twist about.
 Van, the Front.
 Vane, a Weathercock.
 Us, we.
 Use, accustom.
 War, Fighting.
 Ware, Merchandize.
 Wast, has been.
 Waste, to consume.
 Win, to get.
 Wine, to drink.
 Wan, pale.
 Wane, Decrease.
 Writ, in Law.
 Write with a Pen,

A LIST of Words which are pronounced differently from the
 Manner in which they are written.

Adieu, Adu.
 Ancient, Ainsbunt.
 Almond, Amun.
 Anise-seed, Anniseed.
 Apparitor, Paritur.
 Apprentice, Prentis.
 Artichoke, Hartichoke.
 Apothecary, Potticary.
 Answer, Ansur.
 Alchemy, Occamy.
 Enemone, Emmeny.
 Apron, Apurn.
 Apostem, Imposthume.
 Atchievement, Hatchment.
 Atheist, Athist.
 Athwart, Athurt.
 Aukward, Awkurd, or un-
 kurd.
 Auricula, Recklus.
 Awri, Auri.
 Balast, Ballas.

Balcony, Belcony.
 Balustre, Bannister.
 Ballad, Ballet.
 Beau, Bo.
 Beauty, Buty.
 Boatwain, Bosen.
 Bosom, Boozum.
 Bureau, Buro.
 Business, Bizness.
 Bury, Berry.
 Burgamot, Burgamy.
 Buy, By.
 Buyer, Byer.
 Carrion, Carren.
 Centaury, Centry.
 Chaïse, Shaze.
 Chariot, Charriut.
 Chorister, Querister.
 Circle, Surcle.
 Circuit, Surket.

Cochi.

chineal, <i>Cutchineel.</i>	Guinea, <i>Ginee.</i>
cksawin, <i>Cock'sn.</i>	Ghost, <i>Goast.</i>
eworts, <i>Colluts.</i>	Groundfel, <i>Grunsel.</i>
nduit, <i>Cundit.</i>	Gorgeous, <i>Gorjus.</i>
nsfience, <i>Confbounce.</i>	Haut-bois, <i>Hoboy.</i>
nsficientious, <i>Confbenfous.</i>	Haut-goût, <i>Hogo.</i>
onel, <i>Curnel.</i>	Handkerchief, <i>Hankecher.</i>
onftrue, <i>Conftur.</i>	Handsome, <i>Handfum.</i>
roner, <i>Crowner.</i>	Harangue, <i>Harang.</i>
urage, <i>Currage.</i>	Hiccough, <i>Hiccup.</i>
rtely, <i>Curchee.</i>	Hieroglyphick, <i>Hirogliffic.</i>
ugh, <i>Coff.</i>	Hierarchy, <i>Hirarchy.</i>
me, <i>Quine.</i>	Height, <i>Hait, or Hite.</i>
ckow, <i>Coocoo.</i>	Houfwife, <i>Huzif, or Huf-</i>
cumber, <i>Cowcomber.</i>	<i>sey.</i>
oboard, <i>Cubbard.</i>	Honey, <i>Hunnee.</i>
hion, <i>Coofben.</i>	Hymn, <i>Him.</i>
pher, <i>Sifur.</i>	Jeopardy, <i>Jepurdee.</i>
ughter, <i>Dawter,</i>	Jessamine, <i>Jeffamy.</i>
hauchee, <i>Debofbee.</i>	Joift, <i>Jice.</i>
iamond, <i>Dimund.</i>	Jonquil, <i>Junquil.</i>
tionary, <i>Dixnery.</i>	Iron, <i>Irun.</i>
ugh, <i>Do.</i>	Island, <i>Ilan.</i>
ngeon, <i>Dunjun.</i>	Isle, <i>Isle.</i>
nt, <i>Eit.</i>	Isthumus, <i>Ifmus.</i>
endre, <i>Awntandre.</i>	Juice, <i>Juce.</i>
ough, <i>Enuff.</i>	Knowledge, <i>Nollege.</i>
ign, <i>Infine.</i>	Knob, <i>Nob.</i>
rand, <i>Arrant.</i>	Knuckle, <i>Nuckle.</i>
hew, <i>Efchue or Efchu.</i>	Knight, <i>Night.</i>
ee, <i>U.</i>	Lackquay, <i>Lackee.</i>
change, <i>Change.</i>	Laughter, <i>Lafter.</i>
chequer, <i>Checker.</i>	League, <i>Leeg.</i>
much, <i>Unuke.</i>	Leopard, <i>Leppard.</i>
hort, <i>Exort.</i>	Lieu, <i>Lu.</i>
ee, <i>I.</i>	Lieutenant, <i>Lefteenant.</i>
othing, <i>Farden.</i>	Liquor, <i>Likkur.</i>
hion, <i>Fafhun.</i>	Lufcious, <i>Lufbus.</i>
gn, <i>Fain.</i>	Machine, <i>Mafbine.</i>
ffee, <i>Feffee.</i>	Melancholy, <i>Mallancolee.</i>
ft, <i>Fuft.</i>	Maftiff, <i>Maftee.</i>
umenty, <i>Furmetry.</i>	Myrrh, <i>Mir.</i>
endfhip, <i>Frenfhip.</i>	Medicine, <i>Mets'n.</i>

Monkey, <i>Munkee</i> .	Schedule, <i>Seddule</i> .
Mithridate, <i>Mettridate</i> .	Schism, <i>Sism</i> .
Monsieur, <i>Mounseer</i> .	Schismatic, <i>Sismatic</i> .
Mortgage, <i>Morgage</i> .	Skummer, <i>Skimmer</i> .
Money, <i>Munnee</i> .	Sheriff, <i>Shreeve</i> .
Nephew, <i>Nevu</i> .	Shipwright, <i>Shiprite</i> .
Neigh, <i>nay</i> .	Sigh, <i>Si</i> , or <i>Sithe</i> ,
Nauseous, <i>Nausbus</i> .	Symptom, <i>Simptum</i> .
Neighbour, <i>Nabur</i> .	Slaughter, <i>Slawter</i> .
Northwest, <i>Nor-west</i> .	Slough, <i>Slow</i> .
Nuisance, <i>Nufance</i> .	Sallad, <i>Sallet</i> .
Ocean, <i>Oshun</i> .	Spaniel, <i>Spannel</i> .
Onion, <i>Unyan</i> , or <i>Inyan</i> .	Stomach, <i>Stummuk</i> .
Owe, <i>O</i> .	Subtilty, <i>Suttlety</i> .
Ought, <i>awt</i> .	Suit, <i>Sute</i> .
Oatmeal, <i>Otmel</i> .	Sword, <i>Sword</i> .
Pursuivant, <i>Pursevant</i> .	Swoon, <i>Sound</i> .
Parliament, <i>Parliment</i> .	Synagogue, <i>Sinnagog</i> .
Postscript, <i>Poscrip</i> .	Through, <i>throo</i> .
Pentateuch, <i>Pentatuke</i> .	Thirsty, <i>thustee</i> .
People, <i>Peeple</i> .	Toilet, <i>Twilet</i> .
Perfect, <i>perfet</i> .	Tongue, <i>Tung</i> .
Phlegm, <i>Pbleem</i> .	Tough, <i>tuff</i> .
Physic, <i>Fizzic</i> .	Truncheon, <i>Trunshun</i> .
Physician, <i>Fizzishun</i> .	Tuesday, <i>Tuzedy</i> .
Phthisic, <i>Tizzic</i> .	Vault, <i>Vaut</i> .
Pique, <i>Peek</i> .	Venison, <i>Venz'n</i> .
Pottage, <i>Porridge</i> .	Verdict, <i>Verdit</i> .
Prothonotary, <i>Prothbonnetor</i> .	Verjuice, <i>Vargefs</i> .
Psalms, <i>Saam</i> .	Victuals, <i>Vittles</i> .
Quotient, <i>Cushent</i> .	View, <i>Vu</i> .
Rendezvous, <i>Randevoo</i> .	Voyage, <i>Voige</i> .
Righteous, <i>ritchus</i> .	Usquebaugh, <i>Uskeba</i> .
Roqueleau, <i>Rokkela</i> .	Wednesday, <i>Wensday</i> .
Rough, <i>ruff</i> .	Weight, <i>Wait</i> .
Saffron, <i>Soffurn</i> .	Whoredom, <i>Hoordum</i> .
Sarsenet, <i>Sasnet</i> .	Wholesome, <i>Holesum</i> .
Scholar, <i>Scollur</i> .	Whortle-berry, <i>Hurtle-berry</i> .
Sentinel, <i>Sentry</i> .	Women, <i>Wimmen</i> .
Serjeant, <i>Sarjant</i> .	Whose, <i>Hooz</i> .
Seven-night, <i>Sennet</i> .	Wrestle, <i>rofle</i> .
Seignior, <i>Sennior</i> .	Waistcoat, <i>Wescot</i> .
Scent, <i>Sent</i> .	Wristband, <i>Wrisban</i> .

Wrought,

Wrought, *rawt*.
Wry-neck, *Rineek*.
You, *U*.

Yacht, *Yot*.
Yoeman, *Yemun*.
Youth, *Yoth*.

A TABLE of Proper Names written very different from
their Pronunciation.

Agmondesham, *Amersham*.
Augustin, *Austin*.
Alresford, *Alsford*.
St. Alban's, *St. Awban's*.
Abraham, *Abrum*.
Aix la Chapelle, *A la Shap-
pel*.
Bartholomew, *Bartlemy*.
Birmingham, *Brummigum*.
Berwick, *Barrick*.
Blenheim, *Blennem*.
Bourdeaux, *Boordo*.
Brentford, *Bransford*.
Bristol, *Bristo*.
Cecily, *Sisly*.
Champaign, *Champagne*.
Chefnut, *Chefs'n*.
Christmas, *Crismus*.
Cirencester, *Cisseter*.
Cologne, *Cullen*.
Deptford, *Dedford*.
Dorothy, *Dorrotty*.
England, *Inglan*.
Esther, *Estur*.
February, *Feburrery*.
Geoffry, *Jeffry*.
George, *Jorge*.
Glasgow, *Glasgo*.
Guernsey, *Garnzy*.
Gloucester, *Gloster*.
Guild-Hall, *Yeel-Hall*.
Hertford, *Harford*.
Holborn, *Hoburn*.
Hugh, *Hu*.
Humphry, *Umfry*.

Isaac, *Izac*.
Katharine, *Katturn*.
Leicester, *Lester*.
Leonard, *Lennard*.
Lincoln, *Lincon*.
London, *Lunnun*.
Loughborough, *Lufburro*.
Margaret, *Margate*.
Michaelmas, *Micklemus*.
St. Neot's, *St. Need's*.
Nicholas, *Nicklefs*.
Okehampton, *Okkinton*.
Paul's-Church, *Pole's-Church*.
Philip, *Fillup*.
Ranelagh, *Rennela*.
Rhenish, *Rennish*.
Rotherhith, *Redriff*.
Salisbury, *Salisbury*.
Seven-Oak, *Sennuck*.
Sarah, *Sarey*.
Southwark, *Sutbrick*.
Stephen, *Stee'n*.
Thames, *Tems*.
Thanet, *Tennet*.
Theobalds, *Tibbals*.
Thomas, *Tommus*.
Toucester, *Tosseter*.
Toulon, *Tooloon*.
Versailles, *Versails*.
Walter, *Watur*.
Warwick, *Warrick*.
Worcester, *Wuster*.
Waltham, *Waltum*.
Westminster, *Westmister*.
Zachary, *Zaccry*.



A TABLE of Words which have the same or nearly a like Sound, but are different in Signification or Spelling.

Accidence, a Book.
Accidents, Chances.

Account, Esteem.

Account, Reckoning.

Accompt, Reckoning.

Advice, Counsel.

Advise, to counsel.

Ale, Malt Liquor.

Ail, a Disorder.

All, every one.

Awl, to bore Holes with.

Alehoof, an Herb.

Aloof, at a Distance.

Allay, to diminish.

Alloy, of Metal.

Alley, a narrow Passage.

Ally, a Confederate.

Allow'd, granted.

Aloud, with a Noise.

Alter, to change.

Altar, for Sacrifice.

Aunt, Mother's Sister.

Ant, a Pismire,

Are, be.

Air, we breathe.

Heir, the eldest Son.

Anchor of a Ship.

Anchor of Brandy.

Arrant, notorious.

Errand, a Message.

Arrais, Hangings.

Harraís, to trouble.

Arrows, to shoot.

Array, good Order.

Array, Apparel.

Assent, Agreement.

Ascent, going up.

Asp, a Viper.

Hasp, of a Door.

Assistance Help.

Assistants, Helpers.

Auger, a Soothsayer.

Augre, to bore with.

Axe, to cut with.

Acts, Deeds.

Bacon, Hog's Flesh.

Beacon, to fire.

Beckon, to call by a Sign.

Bail, Surety.

Bale, of Cloth.

Bald, without Hair.

Bawl'd, cried out.

Ball, any round Thing.

Bawl, to cry aloud.

Bark, as a Dog.

Bark, of a Tree.

Barque, a Ship.

Beau, a Fop.

Bow, to shoot with.

Bear, to carry.

Bear, a wild Beast.

Bare, a Child.

Bare, naked.

Bear, did bear.

Base, mean.

Baize, Cloth.

Bass, in Musick.

Bass, a Hassock.

Bay, in the Sea.

Bay, a Colour.

Bay, or bark.

Bay, to stand at Bay.

Bay

Bay, a Tree.
 Be, are,
 Bee, that gathers Honey.
 Beer, to drink.
 Bier, to carry the Dead.
 Bel, an Idol.
 Bell, to ring.
 Berry, of a Tree.
 Bury, the Dead.
 Blew, did blow.
 Blue, a Colour.
 Blow, a Stroke.
 Blow, with Bellows.
 Blower, to put before the Fire.
 Blower. a Sort of Whale.
 Board, a Plank.
 Board, to table.
 Board, or a Ship-board.
 Bored, a Hole.
 Bolt, to fasten a Door.
 Boul, Meal.
 Bow, to bend.
 Bough, a Branch.
 Box, of Wood.
 Box, a Tree.
 Boy, a Lad.
 Buoy, for a Cable.
 Bread, to eat.
 Bred, brought up.
 Breaches, to wear.
 Breaches, broken-Places.
 Bruit, a Report,
 Brute, a Beast.
 Burrow, for Rabbits.
 Borough, a Town.
 By, near.
 Buy, for Money.
 Bruise, from a Blow.
 Brews, he breweth.
 Bull, a beast.
 Bull, the Pope's Brief.
 Bull, a Blunder.
 Buss, a Fishing Vessel.

Buss, a Kiss.
 Buzz, the Noise of a Fly.
 Cabal, of the Jews.
 Cabal, to make Parties.
 Call, by Name.
 Cawl, over the Bowels.
 Cawl of a Perriwig.
 Cannon, a great Gun.
 Canon, a Rule.
 Canon of a Cathedral.
 Caper, a jumping high.
 Caper, that is pickled.
 Capital, principal.
 Capital of a Pillar.
 Capitol, at Rome.
 Career, full speed.
 Carrier, that carrieth.
 Cellar, underGround.
 Seller, that selleth.
 Censer, for Incense.
 Censure, Judgment.
 Censor, a Reformer.
 Centry, a Guard.
 Century, a hundred Years.
 Centaury, an Herb.
 Catch, a Song.
 Catch, to lay hold of.
 Chamber, a Room.
 Chamber of a Gun.
 Char, a Fish.
 Chare, a Job of Work.
 Chair, to sit in.
 Charr, to make Charcoal.
 Chap, to open.
 Chape of a Scabbard.
 Chape of a Buckle.
 Choler, Anger.
 Choler, the Bible.
 Collar, for the Neck.
 Collar, of a Coat.
 Cieling of a Room.
 Sealing a Letter.
 Choir, or Quire of a Church.
 Quire

Quire of Paper.
 Cistern, musical Instrument.
 Citron, a Fruit.
 Civil, courteous.
 Civil, Law so called.
 Civil, or intestine War.
 Clause of a Sentence.
 Claws of a Bird.
 Coarse, not fine.
 Course, to run.
 Clerk, a Clergyman.
 Clerk of a Parish.
 Clerk to an Attorney.
 Common, a free Pasture.
 Common, usual.
 Commune, to converse.
 Commons, in Parliament.
 Commons, the regular Diet
 of a College or Society.
 Condemn, to Death.
 Contemn, to despise.
 Cornhill, a Street.
 Cornwall, a County.
 Cou'd, was able.
 Cud, to chew the Cud.
 Coat, a Garment.
 Cote, a Cottage.
 Comet, a blazing Star.
 Commit, to do.
 Cockle, a Shell-fish.
 Cockle, to pucker, wrinkle.
 Cockle, a Corn-weed.
 Coffin, for the Dead.
 Coffin, of a Horse's Hoof.
 Council, an Assembly.
 Councel, a Councillor.
 Counsel, Advice.
 Current of Water.
 Currant, a Fruit.
 Creek of the Sea.
 Crick in the Neck.
 Cousin, a Relation.
 Cozen, to cheat.

Cymbel, an Instrument.
 Symbol, a Mark.
 Cruse, a little Vessel.
 Cruise, the Course of a Ship.
 Cygnet, a young Swan.
 Signet, a Seal.
 Dam, a Beast that has Young.
 Dam to stop Water.
 Damn, to condemn.
 Dame, a Lady.
 Dear, beloved.
 Dear, of a high Price.
 Deer, in a Park.
 Dare, a River-Fish.
 Dare, to be bold.
 Date, a Fruit.
 Date of a Letter.
 Decent, becoming.
 Descent, going down.
 Dissent, to differ.
 Deceased, Dead.
 Diseased, sick.
 Deck of a Ship.
 Deck, to set off.
 Decoy, a Place to catch Wild
 Ducks.
 Decoy, to entice.
 Defer, to put off.
 Differ, to disagree.
 Desert, Merit.
 Desert, a sandy Wilderness.
 Desart, to forsake.
 Dew from Heaven.
 Due, a Debt.
 Do, to make.
 Doe, a female Deer.
 Dough, Paste.
 Done, acted.
 Dun, a Colour.
 Dun, for Money.
 Doer, that doeth.
 Door of a House.
 Down, the softest Feathers.

Down, downward.
 Dragon, a wing'd Serpent.
 Dragon, a Soldier.
 Draught of Drink.
 Drought, Dryness.
 Ear, for hearing.
 Ear of Corn.
 E'er, ever.
 Ere, before.
 Year, twelve Months.
 Early, betimes.
 Yearly, every Year.
 Earth, the Ground.
 Hearth, near the Fire-Place.
 Earn, to work for.
 Yearn, pity.
 Yarn, Wool spun into Thread.
 East, the Wind.
 Yeast, to make Bread.
 Easter, the Festival.
 Esther, a Woman's Name.
 Eminent, famous.
 Imminent, over Head.
 Enter, to go in.
 Interr, to bury.
 Envy, Hatred.
 Envoy, a Messenger.
 Exercise, by walking, &c.
 Exorcise, to conjure.
 Extant, in Being.
 Extent, Largeness.
 Fain, desirous.
 Feign, to pretend.
 Faint, languid.
 Feint, a Pretence.
 Fair, comely.
 Fair, an annual Market.
 Fare, Diet.
 Fare, a customary Price.
 Fear, Dread.
 Veer, to change as the Wind.
 Feed, to eat.
 Fee'd, rewarded.

Fellon, a Willow.
 Felon, a Criminal.
 Figure, Shape.
 Vigour, Strength.
 File, a Smith's Tool.
 File, to put loose Papers on.
 File of Soldiers.
 Foil, a fencing Instrument.
 Foil, to overcome.
 Foil, to set off another.
 Foil of a Looking-Glass.
 Firr, a Wood.
 Furr of a Skin.
 Flue of a Chimney.
 Flew, did fly.
 Fly, an Insect.
 Fly of a Jack.
 Flea, an Insect.
 Flee, to run away.
 Flea'd, stripp'd off the Skin.
 Fled, escaped by Flight.
 Fleam, a Surgeon's Instrument.
 Phlegm, one of the Humours
 of the Body.
 Floor of a House.
 Flour of Wheat.
 Flower of a Garden.
 Fin'd, amerced.
 Find, to discover.
 Fiend, an evil Spirit.
 Feign'd, pretended.
 Follow, to go after.
 Fallow, Ground untill'd.
 Fond, loving dearly.
 Fund, a Stock of Money.
 Font, to christen at.
 Font of Letters.
 Fount, a Fountain.
 Foot, Part of the Body.
 Foot in Measure.
 Foot of a Verse.
 Forth, abroad.
 Fourth in Number.

D

Form,

Form, to fashion.	Hall, a Room.
Form, to sit on.	Haul, to pull.
Form, in a School.	Hare, an Animal.
Form of a Hare.	Hair of the Head.
Foul, nasty.	Heir, the eldest Son.
Fowl, a Bird.	Hair-brained, rash, giddy.
Francis, a Man's Name.	Hash, minced Meat.
Frances, a Woman's Name.	Harsh, severe.
Fray, a Quarrel.	Hart, an Animal.
Fray, to disorder the Threads of Muslin or fine Linen.	Heart, in the Breast.
Frays, Quarrels.	Heaven, on high.
Froise, a Sort of Pancake.	Haven, a Harbour.
Frize, a Sort of Cloth.	Herd of Cattle.
Freeze, with Cold.	Heard, did bear.
Fry in a Pan.	Hard, not soft.
Fry of Fish.	Hard, difficult.
Genteel, graceful.	Heel, of the Foot.
Gentile, a Heathen.	Heal, to cure.
Gentle, quiet.	Here, in this Place.
Gesture, Carriage.	Hear, to hearken.
Jester, a merry Fellow.	Hie, make Haste.
Gilt with Gold.	High, lofty.
Guilt of Sin.	Hoy, a small Ship.
Glutinous, sticking.	Him, that Man.
Gluttonous, greedy.	Hymn, a sacred Song.
Grate of Iron.	Hire, Wages.
Great, large.	Higher, more high.
Greet, to salute.	His, of him.
Grater for a Nutmeg.	Hiss, like a Snake.
Greater, more large.	Hoar, Frost.
Grieve, to lament.	Whore, a lewd Woman.
Greave, Armour for the Legs.	Hole, a hollow Place.
Grave, solemn.	Whole, entire.
Grave, for the Dead.	Hollow, having a Cavity.
Groan, from Pain.	Holloo, a Dog.
Grown, increased.	Hallow, to make holy.
Grot, a Cave.	Halo, a Circle round the Sun.
Groat, four Pence.	Holy, divine.
Grot, a husked Oat.	Wholly, entirely.
Hail, in Health.	Holly, a Tree.
Hail, frozen Shower.	Home, one's own House.
Hale, to draw.	Whom? What Man?
	Holm, a Tree.

Hoop of a Cask.
 Whoop, to cry out.
 Hue, Colour.
 Hew, to cut.
 Hugh, a Man's Name.
 I, myself.
 Eye, to see with.
 Idle, lazy.
 Idol, an Image.
 I'll, I will.
 Isle, an Island.
 Isle of a Church.
 Oil of Olive.
 Employ, Work.
 Imply, to signify.
 In, within.
 Inn, for Travellers.
 Incite, to stir up.
 Insight, Knowledge.
 Ingenious, of good Parts.
 Ingenuous, candid.
 Itch, a Distemper.
 Hitch, to catch hold of.
 Keen, sharp.
 Kin, Kindred.
 Kennel, for Dogs.
 Kennel, or Channel, in the
 Street.
 Ketch, a Ship.
 Catch, to lay hold of.
 Catch, a Song.
 Kill, to murder.
 Kiln, for Bricks.
 Kind, good-natured.
 Coin'd, as Money.
 Knave, a dishonest Man.
 Nave of a Wheel.
 Nave of a Church.
 Knight, a Title of Honour.
 Night, not Day.
 Lade the Water.
 Laid down.
 Ladder, to climb up.

Lather, made with Soap.
 Lain, had laid.
 Lane, a narrow Street.
 Latten, Iron tin'd over.
 Latin, a Language.
 Lattice of a Window.
 Lettice, a Woman's Name.
 Lettuce, an Herb.
 Lease of a House.
 Lease, to glean.
 Lees, Dregs of Wine.
 Leash of Hares, i. e. three.
 Leper, having the Leprosy.
 Leaper, a Jumper.
 Lessen, to make less.
 Lesson, to learn.
 Listen, to hearken.
 Lest, for fear that.
 Least, smallest.
 Lethargy, Sleepiness.
 Liturgy, the Common Prayer.
 Lice, a Sort of Vermin.
 Lies, Untruths.
 Lier in wait.
 Lyar, who tells Lyes.
 Limb, a Member.
 Limn, to paint.
 Line, Length.
 Loin of Veal.
 Liquorish, a Lover of feasting.
 Liquorice, a Root.
 Loath, to abhor.
 Loth, unwilling.
 Lo! behold!
 Low, humble.
 Lose, to suffer Loss.
 Loose, slack.
 Louse, of the Head.
 Lower, not so high.
 Lowr, to frown.
 Made, did make.
 Maid, a Virgin.
 Maid, a Fish.

Form, to fashion.	Hall, a Room.
Form, to sit on.	Haul, to pull.
Form, in a School.	Hare, an Animal.
Form of a Hare.	Hair of the Head.
Foul, nasty.	Heir, the eldest Son.
Fowl, a Bird.	Hair-brained, rash, giddy.
Francis, a Man's Name.	Hash, minced Meat.
Frances, a Woman's Name.	Harsh, severe.
Fray, a Quarrel.	Hart, an Animal.
Fray, to disorder the Threads of Muslin or fine Linen.	Heart, in the Breast.
Frays, Quarrels.	Heaven, on high.
Froise, a Sort of Pancake.	Haven, a Harbour.
Frize, a Sort of Cloth.	Herd of Cattle.
Freeze, with Cold.	Heard, did bear.
Fry in a Pan.	Hard, not soft.
Fry of Fish.	Hard, difficult.
Genteel, graceful.	Heel, of the Foot.
Gentile, a Heathen.	Heal, to cure.
Gentle, quiet.	Here, in this Place.
Gesture, Carriage.	Hear, to hearken.
Jester, a merry Fellow.	Hie, make Haste.
Gilt with Gold.	High, lofty.
Guilt of Sin.	Hoy, a small Ship.
Glutinous, sticking.	Him, that Man.
Gluttonous, greedy.	Hymn, a sacred Song.
Grate of Iron.	Hire, Wages.
Great, large.	Higher, more high.
Greet, to salute.	His, of him.
Grater for a Nutmeg.	Hiss, like a Snake.
Greater, more large.	Hoar, Frost.
Grieve, to lament.	Whore, a lewd Woman.
Greave, Armour for the Legs.	Hole, a hollow Place.
Grave, solemn.	Whole, entire.
Grave, for the Dead.	Hollow, having a Cavity.
Groan, from Pain.	Holloo, a Dog.
Grown, increased.	Hallow, to make holy.
Grot, a Cave.	Halo, a Circle round the Sun.
Groat, four Pence.	Holy, divine.
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 Lose, to suffer Loss.
 Loose, slack.
 Louse, of the Head.
 Lower, not so high.
 Lowr, to frown.
 Made, did make.
 Maid, a Virgin.
 Maid, a Fish.

- Main, chief, very.
 Main, the Ocean.
 Mane of a Horse.
 Male, the He, or Man.
 Mail, Armour.
 Mail, Bags of Letters.
 Manner, Fashion.
 Manor, a Lordship.
 Manure, for enriching Land.
 Marsh, watry Ground.
 Mash, to crush.
 Mesh of a Net.
 Marshal, an Officer.
 Martial, warlike.
 Mayor of a Town.
 Mare, to ride on.
 Mead, a Drink made with Honey.
 Mead, a Meadow.
 Mean, of little Value.
 Mean, the Middle.
 Mien, Aspect.
 Meat, to eat.
 Meet, fit.
 Meet, to come together.
 Mete, to measure.
 Message, an Errand.
 Messuage, a House.
 Mews, for Hawks.
 Muse, to meditate.
 Mile, in Measure.
 Moil, to labour.
 Million, ten hundred thousand.
 Melon, a Fruit.
 Mite, a small Bit of Money.
 Mite, in Cheese.
 Might, Strength.
 Moat, a Ditch.
 Mote in the Eye.
 Mote, an Atom.
 More in Quantity.
 Moor, a watry Ground.
 Mower, that mows.
 Moan, to lament.
 Mown, cut down.
 Morning of the Day.
 Mourning, Lamentation.
 Mole, an Animal.
 Mould, fine Earth.
 Mould, to cast in.
 Muscle, a Shell-Fish.
 Muscle of the Body.
 Muzzle, to cover the Mouth.
 Naught, bad.
 Nought, nothing.
 Nay, no.
 Neigh, as an Horse.
 Near, nigh.
 Ne'er, never.
 Neither of the two.
 Nether, lower, nearer.
 New, not old.
 Knew, did know.
 News, Tidings.
 Noose, a Snare.
 No, a Denial.
 Know, to understand.
 None, not one.
 Known, understood.
 Nose of the Face.
 Knows, understands.
 Neal, to harden Glass.
 Kneel on the Knees.
 Nap, Sleep.
 Nap of Cloth.
 Nit of a Louse.
 Knit, to make Hose.
 Nag, a Horse.
 Knag, a Knot.
 Nell, Eleanor.
 Knell, for a Funeral.
 Not, no.
 Knot, to be untied.
 Ore of Metal.
 Oar of a Boat.
 O'er, over.

Of, <i>belonging to.</i>	Pint, <i>half a Quart.</i>
Off, <i>at a Distance.</i>	Point, <i>a Stop.</i>
O, <i>as, O brave!</i>	Point of a Pin.
Oh! <i>Alas!</i>	Point, <i>Needle-work.</i>
Owe, <i>to be indebted.</i>	Please, <i>to content.</i>
One, <i>in Number.</i>	Pleas, <i>of the Crown.</i>
Won, <i>at Play.</i>	Play, <i>as Children.</i>
Own, <i>to acknowledge.</i>	Plea, <i>Defence.</i>
Own, <i>my own Property.</i>	Plough, <i>the Instrument.</i>
Order, <i>Rank.</i>	Plow, <i>to plow the Ground.</i>
Order, <i>Command.</i>	Pore, <i>of the Skin.</i>
Ordure, <i>Dung.</i>	Pore, <i>with the Eyes.</i>
Our, <i>of us.</i>	Posy, <i>of Flowers.</i>
Hour, <i>in Time.</i>	Poesy, <i>Poetry.</i>
Palate of the Mouth.	Place, <i>of Abode.</i>
Pallet, <i>a little Bed.</i>	Plaife, <i>a Flat-Fish.</i>
Palliate, <i>to cover or hide.</i>	Plait, <i>the Hair.</i>
Pall, <i>for a Funeral.</i>	Plate, <i>of Metal.</i>
Paul, <i>a Man's Name.</i>	Plum, <i>a Fruit.</i>
Parasite, <i>a Flatterer.</i>	Plumb, <i>a Plumb-line or Rule.</i>
Parricide, <i>one that murders</i> <i>his Father.</i>	Plume, <i>of Feathers.</i>
Pale, <i>a Colour.</i>	Pole, <i>a long Stick.</i>
Pale, <i>a Fence.</i>	Pole, <i>of the World.</i>
Pail, <i>to hold Water.</i>	Poll, <i>the Head.</i>
Pain, <i>or Anguish.</i>	Poll, <i>to cut the Hair.</i>
Pane of Glass.	Poll, <i>at an Election.</i>
Parson, <i>of a Parish.</i>	Pool, <i>of Water.</i>
Person, <i>some body.</i>	Porcelane, <i>China Ware.</i>
Peal, <i>in Ringing.</i>	Purslane, <i>an Herb.</i>
Peel, <i>of a Fruit.</i>	Pour, <i>as Water.</i>
Pear, <i>a Fruit.</i>	Power, <i>Might.</i>
Pare, <i>to cut.</i>	Pray, <i>to beseech.</i>
Pair, <i>a Couple.</i>	Prey, <i>a Booty.</i>
Peer, <i>a Lord.</i>	Presence, <i>being here.</i>
Pier, <i>of a House.</i>	Presents, <i>Gifts.</i>
Pier, <i>of a Haven.</i>	Princes, <i>King's Sons.</i>
Peter, <i>a Man's Name.</i>	Princess, <i>a King's Daughter.</i>
Petre, <i>as Salt-petre.</i>	Principal, <i>chief.</i>
Pence, <i>as Six-pence.</i>	Principle, <i>the first Rule.</i>
Pens, <i>to write.</i>	Practice, <i>Exercise.</i>
Pick, <i>to chuse.</i>	Practice, <i>often to do a Thing.</i>
Pique, <i>a Grudge.</i>	Precedent, <i>Example.</i>
	President, <i>of a Council.</i>
	Profit,

- Profit, *Advantage.*
 Prophet, *a Foreteller.*
 Prophecy, *a Foretelling.*
 Prophefy, *to fortel.*
 Quean, *a Strumpet.*
 Queen, *the King's Wife.*
 Quench, *to put out Fire.*
 Quince, *a Fruit.*
 Quire, *of Paper.*
 Choir, *of Singers.*
 Choir, *in a Cathedral.*
 Quarry, *of Stone.*
 Quarry, *dead Fowl.*
 Quarrel, *of Glafs.*
 Quarrel, *a falling out.*
 Rack, *to torment.*
 Rack, *to put Hay in.*
 Rack, *to lay a Spit on.*
 Rack, *for Bottles.*
 Rake, *for Hay.*
 Rake, *a Spendthrift.*
 Wreck, *of a Ship.*
 Rain, *Water.*
 Rein, *of a Bridle.*
 Reign, *of a King.*
 Raifin, *a Fruit.*
 Reason, *Argument.*
 Reach, *give me.*
 Retch, *or stretch.*
 Rich, *wealthy.*
 Wretch, *a miserable Person.*
 Raife, *to set up.*
 Rays, *Sun Beams.*
 Rafe, *to blot out.*
 Race, *to run.*
 Red, *a Colour.*
 Read, *did read.*
 Read, *in a Book.*
 Reed, *a Rush.*
 Reddish, *somewhat red.*
 Radish, *a Root.*
 Relick, *a Remainder.*
 Relick, *of a Saint.*
 Relict, *a Widow.*
 Rear, *the back Part.*
 Rear, *to erect.*
 Rest, *quiet.*
 Wrest, *to turn.*
 Rime, *a frozen Mist.*
 Rhyme, *in Verse.*
 Rice, *Corn.*
 Rise, *Advancement.*
 Rye, *Corn.*
 Wry, *crooked.*
 Ring, *the Bells.*
 Wring, *the Hands.*
 Rite, *a Ceremony.*
 Right, *just and true.*
 Wright, *a Workman.*
 Write, *with a Pen.*
 Rode, *did ride.*
 Road, *the Highway.*
 Row'd, *did row.*
 Row, *on the Water.*
 Roe, *a Deer.*
 Row, *a Rank.*
 Roam, *or wander.*
 Room, *Part of a House.*
 Rheum, *a Humour.*
 Rote, *by Custom.*
 Wrote, *did write.*
 Wrought, *work'd.*
 Ruff, *to wear round the Neck.*
 Rough, *not smooth.*
 Roof, *Top of the House.*
 Sail, *of a Ship.*
 Sale, *of Goods.*
 Saver, *that saveth.*
 Savour, *a Smell.*
 Saviour, *of the World.*
 Satiety, *Fulness.*
 Society, *Company.*
 Sea, *the Ocean.*
 See, *with the Eyes.*
 See, *of a Bishop.*

Seam, in a Coat.
 Seem, appear.
 Seen, beheld.
 Scene, in a Play.
 Seas, great Waters.
 Seize, to lay hold of.
 Cease, to leave off.
 Sent, did send.
 Scent, a Smell.
 Shew, to make appear.
 Shoe, for the Foot.
 Ship, for Sailing.
 Sheep, an Animal.
 Shoar, a Prop.
 Shore, the Sea-Coast.
 Sewer, a common Drain.
 Shown, exposed to View.
 Shone, did shine.
 Shred, of Cloth.
 Shread, to mince.
 Shred, minced.
 Sine, in Geometry.
 Sign, a Token.
 Sign, a Constellation.
 Site, Situation.
 Sight, seeing.
 Cite, to summon.
 Sink, to go down.
 Cinque, five.
 Slight, to despise.
 Sleight, of Hand.
 Slight, not strong.
 Sloe, a sour Fruit.
 Slow, not fast.
 Slough, a miry Place.
 Soal, of a Shoe.
 Sole, a Fish.
 Soul, of a Man.
 Sole, alone, or only.
 Sum, the Whole.
 Some, a Part.
 Sun, that shines.
 Son, a Man Child.

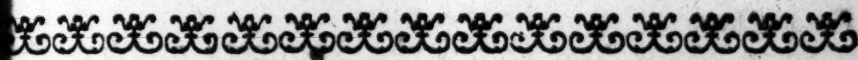
Soon, quickly.
 Swoon, to faint away.
 Spear, a Weapon.
 Sphere, a Globe.
 Spare, to save.
 Statue, or Image.
 Statute, or Law.
 Stature, Bigness.
 Streight, not crooked.
 Strait, narrow.
 Sword, a Weapon.
 Soar'd, did soar.
 Sore, an Ulcer.
 Soar, to mount aloft.
 Sower, of Seed.
 Stare, to look earnestly.
 Stair, to ascend.
 Stare, a Bird.
 Steer, a young Bullock.
 Steer, to guide a Sheep.
 Stead, in Room of
 Steed, a Horse.
 Stile, to get over.
 Style, in Writing.
 Stood, did stand.
 Stud, for a Shirt.
 Stud, an Embossment.
 Stud, to breed Horses.
 Succour, Help.
 Sucker, a young Twig.
 Sue, at Law.
 Sue, to make a Suit.
 Sew, with a Needle.
 Swoon, to faint.
 Sound, Noise.
 Sound, not decayed.
 Tail, of a Beast.
 Tale, a Story.
 Tale, in Number.
 Tare, Weight allowed.
 Tear, to rend.
 Tares, Vetches.
 Tears, to shed Tears.

Team,

- Team, of Horses.
 Teem, with Child.
 Than, in comparing.
 Then, at that Time.
 There, in that Place.
 Their, of them.
 Through, thorow.
 Throw, to cast.
 Throne, of a King.
 Thrown, did throw.
 Tide, Flux of the Sea.
 Ty'd, made fast.
 Tie, or make fast.
 Tile, of an House.
 Toil, to take Pains.
 Toast, as Toast and Ale.
 Tost, on the Sea.
 Time, as a Day.
 Thyme, a Pot-Herb.
 To, unto.
 Toe, of the Foot.
 Tow, to drag along.
 Too, likewise.
 Two, a Couple.
 Told, as a Tale.
 Toll'd, as a Bell.
 Toll'd, having paid Toll.
 Tongs, for the Fire.
 Tongues, Languages.
 Tongues, as Neat's Tongues.
 Tower, of a Church.
 Tower, of Defence.
 Towr, to fly up.
 Tour, a Journey.
 Vacation, Leisure.
 Vocation, a Calling.
 Vale, a Valley.
 Veil, a Covering.
 Veal, Calves Flesh.
 Vain, or idle.
 Vane, for the Wind.
 Vein, of the Arm.
 Valley, a low Place.
 Value, worth.
 Volley, of Shot.
 Vassal, a Slave.
 Vessel, for Liquor.
 Vial, of Glass.
 Viol, for Musick.
 Vice, an ill Habit.
 Vice, of a Smith.
 Voice, a Sound of Words.
 Vyes, emulates.
 Umbles, of a Deer.
 Humbles, he submits himself.
 Ure, Practice.
 Ewer, a Bason.
 Your, of your.
 Use, to be wont.
 Ewes, Sheep.
 Wade, in the Water.
 Weigh'd, in the Balance.
 Wail, to lament.
 Whale, a great Fish.
 Whale, a Mark of a Whip.
 Wane, to decrease.
 Wain, a Waggon.
 Wean, a Child.
 Waits, or the City Musick.
 Weights, to weigh with.
 Way, to walk in.
 Wey, forty Busbels.
 Whey, of Milk.
 Weigh, to poize.
 Wield, to manage.
 Wild, untamed.
 Wait, to look for.
 Weight, Heaviness.
 Ware, Merchandize.
 Wear, to put on Cloaths.
 Were, was.
 Where, in what Place.
 Waist, the Middle.
 Waste, to spend.
 Wast, wert.
 Wheel, of a Cart.

Veal, good.
 Wheal, a Pimple.
 When, at what Time.
 Ven, a Swelling.
 Vet, with Water.
 Whet, to sharpen.
 While, in the mean Time.
 Wile, Deceit.
 Wist, knew.
 Whist, Silence.
 Whist, at Cards.
 Whore, a lewd Woman.
 Hoar, Frost.
 Woer, a Suitor.
 Witch, that conjures.
 Which, who or what.

Woe, Misery.
 Who, which.
 Won, did win.
 One, in Number.
 Wood, of Trees.
 Wou'd, would.
 Yarn, Woolen.
 Earn, to get.
 Yearn, to pity, or have Com-
 passion.
 Ye, yourselves.
 Yea, yes.
 Yew, a Tree.
 Ewe, a Sheep.
 You, yourself.



Of the Plural of Nouns, the Denomination of Sexes, and the
 Preter-Tense and Participle of Verbs.

AS it will be impossible to write good *English* without
 a Knowledge of the Variation of the Spelling of
 Words, caused by the different, Numbers, Tenses, Parti-
 ciples, and Sexes; we shall say as much of these as will be
 necessary to prevent Errors in Speaking and Writing.

A Noun is the Name of a Thing that can be perceived
 by the Senses or the Understanding. A *Noun Substantive*
 is the Name of the Thing itself; as, a *Lamb*, a *Tree*, a
Hat. A *Noun Adjective* shews the Manner of a Thing,
 or what a Thing is, and must be joined to a Thing whose
 Manner it sheweth; as, *good*, *bad*, *wise*, *foolish*, *great*,
small.

Noun Substantives have two Numbers, the *Singular* and
Plural. The Singular Number speaks of one Thing or
 Person; as, a *Hat*, a *Boy*: The Plural of more than one;
 as, *Hats*, *Boys*. The Plural Number is commonly made
 by adding *s* to the Singular. Thus *Hand* makes *Hands*;
Girl, *Girls*. But when the Singular ends in *cb*, *sh*, *ss*, or
x, then the Pronunciation requires that *e* be put before *s*;
 as *Church*, *Churches*; *Brush*, *Brushes*; *Witness*, *Witnesses*;
Box, *Boxes*.

Words

Words that end in *f*, or *fe*, make the Plural by changing *f*, and *fe*, into *ves*; as *Calf*, *Calves*; *Knife*, *Knives*; except *Hoof*, which makes *Hoofs*; as also *Roof*, *Grief*, *Dwarf*, *Mischief*, *Handkerchief*, *Relief*, *Scarf*, *Wharf*, *Reproof*, *Strife*; and generally all Words that end in *ff*, unless *Staff*, which make *Staves*. *Y* in the Singular makes *ies* in the Plural; as *Heresy*, *Heresies*; *Cherry*, *Cherries*.

Some Words form the Plural in a particular Manner; as,

Sing.		Plur.		Sing.		Plur.
<i>Die</i>	} makes	<i>Dice</i>	} makes	<i>Foot</i>	} makes	<i>Feet</i>
<i>Mouse</i>		<i>Mice</i>		<i>Tooth</i>		<i>Teeth</i>
<i>Louse</i>		<i>Lice</i>		<i>Penny</i>		<i>Pence</i>
<i>Goose</i>		<i>Geese</i>		<i>Ox</i>		<i>Oxen</i>
<i>Man</i>		<i>Men</i>		<i>Child</i>		<i>Children</i>
<i>Woman</i>		<i>Women</i>				

Some Words are used in both; as *Sheep*, *Hose*, *Swine*, *Fern*, *Deer*.

Some Words have no Singular Number; as *Ashes*, *Belows*, *Bowels*, *Breeches*, *Entrails*, *Lungs*, *Scissars*, *Shears*, *Snuffers*, *Thanks*, *Tongs*, *Wages*.

Some Words have no Plural Number; as the proper Names of Cities, Countries, Rivers, Mountains: The Names of *Virtues*, *Vices*; as *Meekness*, *Drunkenness*: The Names of Metals; as *Gold*, *Silver*, *Copper*: The Names of most Herbs; as *Sage*, *Marjoram*, *Thyme*; except *Poppies*, *Lillies*, *Coleworts*, *Cabbages*, &c. The Names of several Sorts of Corn and Pulse; as *Wheat*, *Rye*, *Darnel*; except *Bean*, which makes *Beans*, and *Pea*, *Peas*. So *Bread*, *Wine*, *Beer*, *Ale*, *Butter*, *Milk*, *Oil*, *Honey*, want the Plural; except when you speak of several Sorts of *Wines* or *Oils*.

Gender is the Distinction of the *Sex*: Now there are two *Sexes*, *Male* and *Female*, which we have four Ways of distinguishing.

I. When we would express the different *Sexes*, we sometimes do it by different Words.

Male.	Female.
Batchelor	Maid, Virgin
Boar	Sow
Boy	Girl
Bridegroom	Bride
Brother	Sister
Buck	Doe
Bull	Cow
	Bullock

Male.	Female.
Bullock	Heifer
Cock	Hen
Dog	Bitch
Drake	Duck
Drone	Bee
Father	Mother
Friar	Nun
Gander	Goose
Horse	Mare
Husband	Wife
King	Queen
Lad	Las
Lord	Lady
Man	Woman
Master	Mistress
Militer	Spawner
Nephew	Niece
Ram	Ewe
Sloven	Slut
Son	Daughter
Stag	Hind
Uncle	Aunt
Widower	Widow
Wizard	Witch
Whoremonger	Whore, Strumpet

II. When there are not two different Words to express the Difference of the Sexes, or when both Sexes are comprehended under one Word, then we add an Adjective to distinguish the Sex; as a *Male Child*, a *Female Child*; or a *He-Goat* for the Male, and a *She-Goat* for the Female.

III. Sometimes another Substantive is added to the Word to distinguish the Sex; as a *Man-Servant*, a *Maid-Servant*, a *Cock-Sparrow*.

IV. There are likewise some few Words which distinguish the Female Sex from the Male by the ending in *s*.

Male.	Female.
Abbot	Abbess
Actor	Actress
Adulterer	Adulteress
Ambassador	Ambassadress
Count	Countess

Deacon

Words that end in *f*, or *fe*, make the Plural by changing *f*, and *fe*, into *ves*; as *Calf*, *Calves*; *Knife*, *Knives* except *Hoof*, which makes *Hoofs*; as also *Roof*, *Grieff*, *Dwarf*, *Mischief*, *Handkerchief*, *Relief*, *Scarf*, *Wharf*, *Proof*, *Strife*; and generally all Words that end in *ff*, unless *Staff*, which make *Staves*. *Y* in the Singular makes *ies* in the Plural; as *Heresy*, *Heresies*; *Cherry*, *Cherries*.

Some Words form the Plural in a particular Manner; as,

Sing.		Plur.		Sing.		Plur.
<i>Die</i>	} makes	<i>Dice</i>	} makes	<i>Foot</i>	} makes	<i>Feet</i>
<i>Mouse</i>		<i>Mice</i>		<i>Tooth</i>		<i>Teeth</i>
<i>Louse</i>		<i>Lice</i>		<i>Penny</i>		<i>Pence</i>
<i>Goose</i>		<i>Geese</i>		<i>Ox</i>		<i>Oxen</i>
<i>Man</i>		<i>Men</i>		<i>Child</i>		<i>Children</i>
<i>Woman</i>		<i>Women</i>				

Some Words are used in both; as *Sheep*, *Hose*, *Swine*, *Fern*, *Deer*.

Some Words have no Singular Number; as *Ashes*, *Bellows*, *Bowels*, *Breeches*, *Entrails*, *Lungs*, *Scissars*, *Shears*, *Snuffers*, *Thanks*, *Tongs*, *Wages*.

Some Words have no Plural Number; as the proper Names of Cities, Countries, Rivers, Mountains: The Names of *Virtues*, *Vices*; as *Meekness*, *Drunkenness*: The Names of Metals; as *Gold*, *Silver*, *Copper*: The Names of most Herbs; as *Sage*, *Marjoram*, *Thyme*; except *Poppies*, *Lillies*, *Coleworts*, *Cabbages*, &c. The Names of several Sorts of Corn and Pulse; as *Wheat*, *Rye*, *Darnel*; except *Bean*, which makes *Beans*, and *Pea*, *Peas*. So *Bread*, *Wine*, *Beer*, *Ale*, *Butter*, *Milk*, *Oil*, *Honey*, want the Plural; except when you speak of several Sorts of *Wines* or *Oils*.

Gender is the Distinction of the *Sex*: Now there are two *Sexes*, *Male* and *Female*, which we have four Ways of distinguishing.

I. When we would express the different *Sexes*, we sometimes do it by different Words.

Male.	Female.
Batchelor	Maid, Virgin
Boar	Sow
Boy	Girl
Bridegroom	Bride
Brother	Sister
Buck	Doe
Bull	Cow

Bullock

Male.	Female.
Bullock	Heifer
Cock	Hen
Dog	Bitch
Drake	Duek
Drone	Bee
Father	Mother
Friar	Nun
Gander	Goose
Horse	Mare
Husband	Wife
King	Queen
Lad	Lass
Lord	Lady
Man	Woman
Master	Mistress
Milter	Spawner
Nephew	Niece
Ram	Ewe
Sloven	Slut
Son	Daughter
Stag	Hind
Uncle	Aunt
Widower	Widow
Wizard	Witch
Whoremonger	Whore, Strumpet

II. When there are not two different Words to express the Difference of the Sexes, or when both Sexes are comprehended under one Word, then we add an Adjective to distinguish the Sex; as a *Male Child*, a *Female Child*; or a *He-Goat* for the Male, and a *She-Goat* for the Female.

III. Sometimes another Substantive is added to the Word to distinguish the Sex; as a *Man-Servant*, a *Maid-Servant*, a *Cock-Sparrow*.

IV. There are likewise some few Words which distinguish the Female Sex from the Male by the ending in *fs*.

Male.	Female.
Abbot	Abbess
Actor	Actress
Adulterer	Adulteress
Ambassador	Ambassadress
Count	Countess

Deacon

Male.	Female.
Deacon	Deaconess
Duke	Dutchess
Electer	Electress
Emperor	Empress
Governor	Governess
Heir	Heiress
Jew	Jewess
Lion	Lioness
Marquis	Marchioness
Master	Mistress
Patron	Patroness
Prince	Princess
Prior	Prioress
Poet	Poetess
Prophet	Prophetess
Shepherd	Shepherdess
Tutor	Tutress
Viscount	Vicountess

The common Words to express the Sex by is *he*, or *she* but when we speak of a Thing that is neither Male nor Female, we use the Word *it*; we also use *it* when the Sex is undetermined; as, *do not wake the Child, it is asleep*. Yet it is customary to call Things Male and Female that are not so. Thus we call the Sun *he*, and the Church *she*.

There are Irregularities in the Formation of Verbs, which have occasioned many Mistakes both by Speaking and Writing, which I shall now take Notice of, that Errors of that Kind may be avoided.

The first Irregularity takes its Rise from the Quickness of Pronunciation, by changing *d* into *t*, that it might be spoke more free and easy. For *c*, *ch*, *sh*, *f*, *k*, *p*, *x*, and also *s*, *th*, pronounced hard, and sometimes *l*, *m*, *n*, *r*, when a short Vowel goes before, more easily take *t* after them than *d*; as *plac't* for *plac'd* or *placed*; *snatcht* for *snatch'd* or *snatched*; *fisht* for *fist'd* or *fished*; *stut* for *stuffed* or *stuffed*; *clapt* for *clap'd* or *clapped*; *mixt* for *mix'd* or *mixed*, *wak't* for *wak'd* or *waked*; *dwelt* for *dwel'd* or *dwelled*; *smelt* for *smel'd* or *smelled*.

But *d* is retained after *b*, *g*, *v*, *w*, *z*; as also *s*, *t*, when softly pronounced. *D* likewise remains after *l*, *m*, *n*, *r*, when a Vowel goes before. Thus *liv'd*, *smil'd*, *raz'd*, *believ'd*, from

om live, smile, raze, believe: Except felt from feel; dreamt from dream; meant from mean; left from leave; bereft from bereave, &c.

Another common Irregularity relates only to the passive participle, which formerly often ended in *en*.; as *been*, *given*, *taken*, *slain*, *known*; of the Verbs *to be*, *to give*, *to take*, *to slay*, *to know*. We also use *written*, *bitten*, *eaten*, *shotten*, *rotten*, *chosen*, *broken*; as *writ*, *bit*, *eat*, *eat*, *shot*, *rot*, *chose*, *broke*. Thus likewise we say, *shown* or *show'd*; *mown*, or *mow'd*; *loaden* or *loaded*; *laden* or *aded*.

But these Irregularities will appear more plainly from the following Tables.

T A B L E I.

Present Tense.	Preter Tense and Participle.	Present Tense.	Preter Tense and Participle.
wake	awoke.	geld	gelt and gelded
bide	abode.	gild	gilt.
be	been.	gird	girt and girded.
end	bent.	grind	ground.
inbend	unbent.	hang	hung.
ereave	berest.	have	had.
eseech	besought.	hear	heard.
ind	bound.	keep	kept.
leed	bled.	lay	laid.
reed	bred.	lead	led.
ring	brought.	leave	left.
uy	bought.	leap	leapt.
atch	caught.	lend	lent.
reep	crept.	lose	lost.
deal	dealt.	loose	loosened and loos'd
ig	dug and digged	make	made.
ream	dreamt.	mean	meant.
well	dwelt.	meet	met.
eed	fed.	rend	rent.
eel	felt.	say	said.
ight	fought.	seek	sought.
nd	found.	sell	sold.
ee	fled.	send	sent.
ing	flung.	shine	shone and shined.
raight	fraught.	fit	fat.

Rules and Directions for the

<i>Present Tense.</i>	<i>Preter Tense and Participle.</i>	<i>Present Tense.</i>	<i>Preter Tense and Participle.</i>
sleep	slept.	sweep	swept.
smell	smelt.	teach	taught.
spell	spelt.	tell	told.
spill	spilt.	think	thought.
spend	spent.	weep	wept.
spin	spun.	wind	wound.
stand	stood.	work	wrought <i>and</i>
stick	stuck.		work'd.
sting	stung.	wring	wrung.

T A B L E II.

<i>Present Tense</i>	<i>Preter Tense.</i>	<i>Participle.</i>
bear	bore <i>or</i> bare	born
begin	began	begun
bid	bid <i>or</i> bad	bidden
beat	beat	beaten
bite	bit	bitten
blow	blew	blown
break	broke <i>or</i> brake	broken
chide	chid	chidden
chuse	chose	chosen <i>or</i> chid
	{ clave	{ cleft
cleave	{ cleft	{ <i>or</i>
	{ cloven	{ cloven
come	came	came
crow	crew <i>and</i> crow'd	crow'd
dare	durst <i>or</i> dared	dared
die	died	dead
do	did	done
draw	drew	drawn
drink	drank <i>or</i> drunk	drunk
drive	drave <i>or</i> drove	driven
eat	eat	eaten
fall	fell	fallen
fly	flew	flown
forsake	forsook	forfaken
freeze	froze	frozen
get	got	gotten <i>or</i> got
give	gave	given
go	went	gone
grow	grew	grown

help

<i>Present Tense</i>	<i>Preter Tense</i>	<i>Participle.</i>
help	helped or helpt	helpt
hew	hewed	hewn
hide	hid	hidden or hid
hold	held	holden
know	knew	known
lie	lay	lain
mow	mow'd	mown
ride	rid or rode	ridden or rode
ring	rang	rung
rise	rose	risen
run	ran	run
see	saw	seen
seeth	sod	fodden
shake	shook	shaken and shook
shear	shore	shore and shorn
shew	shew'd	shown
shoot	shot	shotten and shot
shrink	shrank	shrunken
sing	sang and sung	sung
sink	sank and sunk	sunk
slay	slew	slain
slide	slid	slidden
sling	slung	slang
smite	smote	smitten
snow	snow'd	snown
sow	sow'd	sown
speak	spoke or spake	spoken and spoke
spring	sprung	sprang
steal	stole	stolen and stole
stink	stank or stunk	stunk
strike	struck	stricken and struck
spit	spat	spitten, spit and spat
strive	strove	striven
swear	swore and sware	sworn
swell	swell'd	swoln or swelled
swing	swung and swang	swung and swang
swim	swum and swam	swum
take	took	taken and took
tear	tore and tare	torn and tore
thrive	throve	thriven
throw	threw	thrown
tread	trod	trodden and trod

<i>Present Tense.</i>	<i>Preter Tense and Participle.</i>	<i>Present Tense.</i>	<i>Preter Tense and Participle.</i>
sleep	slept.	swEEP	swept.
smell	smelt.	teach	taught.
spell	spelt.	tell	told.
spill	spilt.	think	thought.
spend	spent.	weep	wept.
spin	spun.	wind	wound.
stand	stood.	work	wrought <i>and</i> work'd.
stick	stuck.		
string	strung.	wring	wrung.

T A B L E II.

<i>Present Tense</i>	<i>Preter Tense.</i>	<i>Participle.</i>
bear	bore <i>or</i> bare	born
begin	began	begun
bid	bid <i>or</i> bad	bidden
beat	beat	beaten
bite	bit	bitten
blow	blew	blown
break	broke <i>or</i> brake	broken
chide	chid	chidden
chuse	chose	chosen <i>or</i> chid
	{ clave	{ cleft
cleave	{ cleft	{ <i>or</i>
	{ cloven	{ cloven
come	came	came
crow	crew <i>and</i> crow'd	crow'd
dare	durst <i>or</i> dared	dared
die	died	dead
do	did	done
draw	drew	drawn
drink	drank <i>or</i> drunk	drunk
drive	drave <i>or</i> drove	driven
eat	eat	eaten
fall	fell	fallen
fly	flew	flown
forsake	forsook	forsaken
freeze	froze	frozen
get	got	gotten <i>or</i> got
give	gave	given
go	went	gone
grow	grew	grown

help

<i>Present Tense</i>	<i>Preter Tense</i>	<i>Participle.</i>
help	helped or helpt	helpt
hew	hewed	hewn
hide	hid	hidden or hid
hold	held	holden
know	knew	known
lie	lay	lain
mow	mow'd	mown
ride	rid or rode	ridden or rode
ring	rang	rung
rise	rose	risen
run	ran	run
see	saw	seen
seeth	sod	sodden
shake	shook	shaken and shook
shear	shore	shore and shorn
shew	shew'd	shown
shoot	shot	shotten and shot
shrink	shrank	shrunk
sing	sang and sung	sung
sink	sank and sunk	sunk
slay	slew	slain
slide	slid	slidden
sling	slung	slang
smite	smote	smitten
snow	snow'd	snown
sow	sow'd	sown
speak	spoke or spake	spoken and spoke
spring	sprung	sprang
steal	stole	stolen and stole
stink	stank or stunk	stunk
strike	struck	stricken and struck
spit	spat	spitten, spit and spat
strive	strove	striven
swear	swore and sware	sworn
swell	swell'd	swollen or swelled
swing	swung and swang	swung and swang
swim	swum and swam	swum
take	took	taken and took
tear	tore and tare	torn and tore
thrive	throve	thriven
throw	threw	thrown
tread	trod	trodden and trod

Present Tense	Preter Tense	Participle.
win	wan and won	won
wear	wore	worn
weave	wove	woven
write	writ and wrote	written, writ and wrote



Of the right placing or joining Words together in a Sentence.

THE Substantive that *is, does or suffers*, comes before the Verb; as *I am: William loves: The Men walk: The Book is read.* But when a Question is asked, the Verb is put before the Substantive; as, *Is John at Home?* When there is an auxiliary or helping Verb, then the Substantive comes after that; as, *Does Mary love? Will you walk?* When there are two helping Verbs, the Substantive is placed after the first, *Might Charles have brought it?* Likewise in case of a Command, the Substantive is set after the Verb; as, **walk thou, walk ye.* As also when the Verb is used by way of Yielding or Concession; as, *had I known, he should not have done it.* Again, when *there* is put before the Verb, the Nominative Word is put after the Verb; as, *there came a Man to me.* Moreover we say, *It was John that spoke last. It was the Glass that fell, Then followed the Armourers Company. Say I, for I say, said he, for he said.*

When the *Genitive Case* and another Substantive come together, the Genitive Case is always put first; as *John's Horse, not Horse John's.*

An *Adjective* is placed immediately before the Substantive; as *a good Boy, a good Girl, good Books, good Candles.* Unless a Verb comes between the Adjective and the Substantive, as *happy is the Man:* Or when some other Word dependeth on the Adjective; as, *a Subject, loyal to his Prince.*

But when there are more *Adjectives* than one joined together, or one Adjective with other Words depending on it, the Adjective is generally set after the Substantive; as *a Scholar both diligent and learned, a Physician very skilful.* We likewise say, *a diligent and learned Scholar, a skilful Physician.*

When two Substantives are put together in Composition, the first assumes the Nature of an Adjective, and is commonly joined to the following Substantive by a *Hyphen*

phen (-); as a *Sea Crab*, a *Land Crab*; that is a Crab of the Sea, a Crab of the Land: A *Wine Vessel*, a Vessel for Wine; *Home-made*, made at home.

The Article *A* is joined only to a Substantive of the Singular Number, and may be applied indifferently to any Person or Thing. It signifies *one*, but not in a strict Sense, unless in this Phrase, *All to a Man*. But when a Substantive begins with a Vowel or an *h*, then we write *an* instead of *a*, if the *n* be sounded; as, *an Eye*, *an Hour*: But *a Hare*, *a Hound*, *a Hand*, *a Habit*.

The is joined to Substantives as well Plural as Singular, and shews what particular Thing is meant in speaking or writing. It signifies the same as *that*, but not so fully.

The *Pronoun* either is placed before a Verb, or comes after it in a different State; as, *I love the Master*, *the Master loves me*, not, *I*. But *whom* is generally placed before the Verb; as, *He is the Man, whom I saw*. But after the Verb *am* or *be*, we say it is *I*, not *me*.

The Word that answers to the Question, *who is?* *who does?* or, *who suffers?* or *what is?* *what does?* or *what suffers?* is the Substantive to which the Verb relates, and is called the Nominative Word; as, *I love*; Who loves? *I*. *We read*; Who read? *We*. *The Book is read*, What is read? The Book. Here *I*, *We*, and *Book* are the Nominative Words, which are called in *Latin*, the *Nominative Cases*.

Not only Nouns and Pronouns Substantive are Nominative Words to the Verb; but whatever denotes that which *is*, or *does*, or *is done*, is accounted a Nominative Case to the Verb: As, *To play will please*; What *will please?* *To play*: Therefore *to play* is a Nominative to the Verb *please*. Any Sentence may likewise be a Nominative to the Verb; as, *It is clear the Sun shines*: What *is clear?* *That the Sun shines*. Therefore, *That the Sun shines*, is the Nominative to the Verb *clear*.

When a Verb is put infinitively, that is, with the Preposition *to* before it, or if a Sentence be the Nominative to a Verb, we usually set the *Verb infinitive*, or the *Sentence*, after the other Verb, and put *It* before it; as, *It is an evil Thing to lye*; that is, *A Lye is an evil Thing*. *It is the Custom of Boys to neglect their Books*; that is, *To neglect their Books is the Custom of Boys*.

The Verb must be of the same Number and Person as the Nominative Word or Substantive to which it relates; as *Paul readeth, Boys read*. Whereas if you were to say, *Paul read*, or *Boys readeth*, it would be false Grammar.

But when two Substantives Singular are joined together, they speak of more than one; as *William and Mary love*; not *loves*, or *loveth*. Likewise when a Noun of the Singular Number comprehends more things than one, the Verb may be put either in the Plural or Singular; as *the Parliament has or have examined the Witnesses*. Where *has* is the Singular Number, and *have* the Plural.

The Adverb *not*, of denying, is put after the Verb; as *It burned not*, or *it did not burn*.

A single Sentence has but one finite Verb in it; as *Life is short*. By a finite Verb is meant any Verb that is not put infinitively, that is, with *to* before it; as, *to love, to read*. A compound Sentence is when two single Sentences are joined together by some Couple or Tie; as *Life is short, and Art is long*; or, *Life is short, but Art is long*.

Not only Conjunctions, but relative and comparative Words, join single Sentences together; as, *This is the Man whom I saw. He is the Man that stole the Horse. This is the Boy who came to our House. I heard such a Story as you never heard in your Life*.



Of Points, Notes, and Great Letters, used in Printing and Writing.

THE Points or Marks used in Writing and Printing may be distinguished into three Sorts; *Stops of the Voice, Notes of Affection, and Marks in Reading*.

The *Stops of the Voice* shews where to make a Pause and take Breath; and these are four: *Comma (,) Semicolon (;) Colon (:)* and *Period or full Stop (.)*

A *Comma* is the shortest Pause or Rest in Speech, and is chiefly used in distinguishing Nouns, Verbs, and Adverbs; as, *Neither Death, nor Life, nor Angels, nor Principalities, nor Powers, shall separate me from the Love of God. A good Man, and a learned. To exhort, to pray. Sooner, or later, every Body must die*.

A *Semicolon* is the Mark of a Pause that is greater than a Comma, and less than a Colon. The proper Place for this

This Point is the Subdivision of the Members or Parts of a Sentence: *As the Shadow moves, and we do not perceive it; as the Tree grows, and we do not apprehend it; so Man, &c.* And especially where there is a Sort of Opposition between the one and the other; as, *And such were some of you; but you are washed, &c.*

A Colon is used when the Sense is perfect, but the Sentence not ended; as, *If you sing, you sing ill: If you read, you sing.*

A Period or full Stop is the greatest Pause, and is set after the Sentence is compleat and fully ended; as *God is the chiefest Good.*

The Notes of Affection are these two, Interrogation (?) and Exclamation (!). A Note of Interrogation is a Kind of Period, for the Distinction of such Sentences as are proposed by way of Question; as, *Does he yet doubt of it?*

A Note of Exclamation or Admiration is a Note of Direction for raising the Tone or Voice, upon occasion of such Words as denote some sudden Passion of the Mind, as admiring, wishing, or crying out; as, *O the Folly of Man! Alas! Alas! How is the City fallen!*

The other Marks used in Reading are these twelve. 1. Apostrophe ('). 2. Hyphen (-). 3. Parenthesis (). 4. Brackets []. 5. Paragraph ¶. 6. Quotation ("). 7. Section §. 8. Ellipsis —. 9. Index ☞. 10. Asterism *. 11. Obelisk †. 12. Caret (^).

An *Apostrophe* is set over a Word where some Letter is left out; as *lov'd, fear'd*, for *loved, feared*.

A *Hyphen* joins two Words; as *Coach-man, Lilly-root*. Or if a Line ends in the Middle of a Word, it is used to shew that those divided Syllables are to be joined together in Reading.

A *Parenthesis* serves to distinguish an additional Part of the Sentence, that is not necessary to compleat the Sense, but is brought in by the bye to explain and illustrate it; as *Your Kindness to me (which I look upon as a great Happiness) makes me undergo, &c.*

Brackets or *Crotchets*, are used to include a Word or two which is mentioned in the Sentence, as the very Matter of Discourse; as, *The little Word [Man] makes a great Noise in the World*. These Brackets are also used sometimes to include a Part of a Sentence that is quoted from another

Author; as, *Some suppose when David said [Thou wilt shew me the Path of Life] he foretold the Resurrection of Christ.*

The *Paragraph* is now seldom used unless in the Bible, and is intended to distinguish where another Sense or Subject begins.

A *Quotation* is marked with reversed Comma's, which are used when something is repeated or quoted out of another Author; sometimes only at the Beginning and End of the Passage quoted, and sometimes at the Beginning of every Line of it.

A *Section* is used for the same Purpose in other Books, as a *Paragraph* in the Bible; and is for dividing Chapters of any Book into several Parts. However, this Mark is now seldom or never used in the *English Language*; but *Section* or *Section* is put in its Room.

Ellipsis, or, as some call it, a *black Line*, is used when Part of the Word is left out; as P——t, for *Parliament*: Or when Part of a Sentence or Verse is wanting or omitted; as,

—————Remember Milo's End,

Wedg'd in the Timber which he strove to rend.

When Part of a Book or Chapter is lost, it is sometimes marked thus; * * * * *

An *Index* or *Hand*, points to something very remarkable, which ought to be taken notice of.

An *Asterism*, *Asterisk*, or *Star*; also an *Obelisk* or *Dagger*, and other Marks, as †, ||, &c. refer the Reader to something in the Margin, or at the Bottom of the Page.

A *Caret* is placed under the Line where some Word or Syllable is left out; which is written above the Line, and should be read where this Note stands; as,

never

Still shall I bear, and quit the Score?

Δ

Besides all these, there are crooked Lines usually called *Braces*, which are used to couple two or more Words or Lines together, as

The Letter *A* has a $\left. \begin{array}{c} \text{long} \\ \text{short} \\ \text{or} \\ \text{broad} \end{array} \right\}$ Sound.

It is likewise sometimes used in Poetry, when three Lines have the same Rhyme or Ending.

I chanc'd

*I chan'd an old Corycian Swain to know,
Lord of few Acres, and those barren too ;
Unfit for Sheep or Vines, and more unfit to sow.
Yet lab'ring well his little Spot of Ground,
Some scatt'ring Pot-herbs here and there were found.*

A *Diæresis*, or two Points (..) placed over a Vowel when two come together, shew they make distinct Syllables ; as, *Raphäel*. An Accent (`) shews where the Stress of the Sound is to be placed ; as, *constant*. A Circumflex (^) is placed over a Syllable that is to be pronounced long ; as, *Euphrâtes*. A double Accent shews the following Consonant is to be pronounced double ; as, *bà-nish*.

Emphasis is used for the Distinction of such Word or Words wherein the Force of the Sense doth more peculiarly consist ; and is usually expressed by putting such Word in another Character ; as,

*Now Night had shed her silver Drops around,
And with her sable Wings embrac'd the Ground.*

Some write the *emphatical Word* with a capital Letter, when the rest of the Nouns are wrote with a small Letter, except such as Custom requires to be so wrote. What these are it will be now proper to explain.

A Capital or great Letter must never be used among the small in the Middle of a Word or Words, but only at the Beginning of a Word. 1. At the Beginning of any Writing, Book, Chapter, or Paragraph. 2. After a full Stop when a new Sentence begins, and after a Colon. 3. At the Beginning of every Line in Poetry, and every Verse in the Bible. 4. At the Beginning of proper Names of all Kinds: Of Men and Women, as *Thomas, Mary* ; of Places, as *Canterbury* ; of Ships, as the *Speedwell* ; of Rivers, as the *Severn* ; of Dignities, as *King, Queen, &c.* 5. All the Names of God ; as *God, Lord, the Eternal, the Almighty*. 6. Remarkable Words may be all wrote in great Letters ; as, *I AM THAT I AM*. 7. When *I* or *O* are single Words, they must always be wrote in Capitals, *I walk, O brave!* 8. Great Letters are used to express Numbers.

1 One

I

2 Two

II

3 Three

III

4 Four

IV

5. Five

5 Five	V
6 Six	VI
7 Seven	VII
8 Eight	VIII
9 Nine	IX
10 Ten	X
11 Eleven	XI
12 Twelve	XII
13 Thirteen	XIII
14 Fourteen	XIV
15 Fifteen	XV
16 Sixteen	XVI
17 Seventeen	XVII
18 Eighteen	XVIII
19 Nineteen	XIX
20 Twenty	XX
30 Thirty	XXX
40 Forty	XL
50 Fifty	L
60 Sixty	LX
70 Seventy	LXX
80 Eighty	LXXX
90 Ninety	XC
100 One Hundred	C
200 Two Hundred	CC
300 Three Hundred	CCC
400 Four Hundred	CCCC
500 Five Hundred	D or I ^o
600 Six Hundred	DC or I ^o C
700 Seven Hundred	DCC or I ^o CC
800 Eight Hundred	DCCC or I ^o CCC
900 Nine Hundred	DCCCC or I ^o CCCC
1000 One Thousand	M or CI ^o
1759	MDCCLIX
One thousand seven hundred and fifty-nine.	



A Table of ABBREVIATIONS or CONTRACTIONS, wherein one, two, or three Letters stand for one, or more Words.

SOME of these Abbreviations are so common that they are understood by almost every one; and except such they are not to be imitated either in Writing or Printing; for

For every Thing that tends to puzzle the Reader should be avoided as much as possible. What Person of common sense would write *A.* or *An.* for *Answer*? And yet such Contractions as these serve to enlarge the Catalogues in common Books. I shall therefore take Notice of the most usual, and such as have been put in the Title Page of books or otherwise.

<i>A. B.</i> or <i>B. A.</i> Batchelor of Arts.	<i>J. D.</i> <i>Juris Doctor</i> , Doctor of Law.
<i>Abp.</i> Archbishop.	<i>K.</i> King.
<i>A. D.</i> <i>Anno Domini</i> , or in the Year of our Lord.	<i>Km.</i> Kingdom.
<i>M.</i> or <i>M. A.</i> Master of Arts.	<i>Kt.</i> Knight.
<i>B.</i> Book.	<i>Ld.</i> Lord.
<i>B. A.</i> Batchelor of Arts.	<i>L. C. J.</i> Lord Chief Justice.
<i>Bp.</i> Bishop.	<i>Ldp.</i> Lordship.
<i>V. M.</i> Blessed Virgin Mary.	<i>Ladp.</i> Ladyship.
<i>C. C. C.</i> Corpus Christi College.	<i>LL. D.</i> <i>Legum Doctor</i> , Doctor of Laws.
<i>Cent.</i> <i>Centum</i> . a Hundred.	<i>M.</i> Marquess.
<i>C. S.</i> <i>Custos Sigilli</i> , Keeper of the Seal.	<i>M. A.</i> Master of Arts.
<i>D.</i> Duke.	<i>Math.</i> Mathematician.
<i>Dr.</i> Doctor.	<i>M. D.</i> <i>Medicinae Doctor</i> , or Doctor in Physic.
<i>D. D.</i> Doctor in Divinity.	<i>Mr.</i> Master.
<i>Do.</i> Ditto, or the same.	<i>Mrs.</i> Mistress.
<i>E.</i> Earl.	<i>MS.</i> Manuscript.
<i>E. g.</i> or <i>ex. gr.</i> <i>Exempli gratia</i> , for Example.	<i>MSS.</i> Manuscripts.
<i>F. R. S.</i> Fellow of the Royal Society.	<i>M. S.</i> <i>Memoriae sacrum</i> , sacred to the Memory.
<i>Hon.</i> Honourable.	<i>N. B.</i> <i>Nota bene</i> , Mark well.
<i>Id.</i> <i>Idem</i> , the same.	<i>N. S.</i> New Style.
<i>Ibid.</i> <i>ibidem</i> , in the same Place.	<i>O. S.</i> Old Style.
<i>I. H. S.</i> <i>Iesus Hominum Salvator</i> , or Jesus the Saviour of Men.	<i>Penult.</i> Last save one.
<i>I. N. R. I.</i> Jesus of Nazareth King of the Jews.	<i>Per Cent.</i> By the Hundred.
	<i>P. G.</i> Professor in Gresham College.
	<i>P. S.</i> Postscript.
	<i>q. d.</i> <i>quasi dicat</i> or <i>dicat</i> , As much as to say.
	<i>Q.</i> Queen or Question.
	<i>R.</i> <i>Rex</i> , King, or <i>Regina</i> Queen.

G. R. King George.	S. Scilicet, to wit, or that is.
C. R. Queen Carolina.	Sh. Shire.
Rev. Reverend.	Sr. Sir.
Rt. Right.	Ult. Ultimus, last.
Rt. Worpful. Right Wor-	V. Vide, see.
shipful.	Viz. Videlicet, or that is.
Rt. Honble. Right Honour-	V. g. Verbi gratia, for my
able.	Word's Sake.
St. Saint.	Wp. Worship.
S. S. T. Sacrosancta Theologia,	Wpful. Worshipful.
Holy Divinity.	Ec. Et cetera, and so forth.
S. T. P. Doctor in Divinity.	Et. Et. and.
S. Sc. Sacred Scripture.	



General Instructions in the ART of PENMANSHIP.

THE various Sorts of *Hands*, now practised in Great-Britain, may be divided into two Branches, namely, Those of absolute Use for Business; and those which are only ornamental. The former are the *Round-Hand* and *Italian*, in which most of the common Affairs of Trade, and the ordinary Business of Life, are written by all Europeans; and the *Engrossing* and *Square Text*, in which all the various Business of the Law is generally transacted. The other Hands, namely, the *Old English*, the *Roman* and *Italic Prints*, and the *German Text*, are seldom made Use of but by Way of Decoration; and therefore the writing of them is but of little Service, and nothing better than a mere Amusement to such as are intended for common Business.

The principal Things to be aimed at, in order to write all, or either of the Hands well, are these two: *First*, To get an exact Idea of a good Letter; which is done by a frequent and nice Observation of a correct Copy: The other is, to get such a Command of Hand, as to be able to express with the Pen, the Idea upon the Paper; which

is attained by constant and careful Practice after the best Examples.

*Let ev'ry Day some labour'd Line produce;
Command of Hand is gain'd by constant Use.*

In order therefore for the more speedy and effectual Improvement, I shall shew in the first Place, wherein the Beauty of a masterly Performance principally consists.

1. The essential Properties of a good Piece of *Writing* are, a due Proportion of Characters throughout the Whole; a just Distance between the Letters themselves, as well as the Words; with a natural Leaning or Inclination of the Letters one to another; and a clean smooth Stroke, performed with a masterly Boldness and Freedom, without which the most regular Piece is like a dead Corpse, whose Features, though they may be most exact in Symmetry, yet want that Spirit which only can render it an Object both valuable and delightful.

2. The Proportion of the several Letters, in most Hands, are generally regulated by the *o* and *n*; let the making of them therefore be first carefully practised, and then the other Letters that are dependent on them: All which must be of the same Width and Fulness of Stroke as they are of.

3. The Proportion and Shape of Letters in any Hand ought to be the same, whether they be written in a large or small Size; let every Hand therefore be first learned in a large Character, which will not only fix the Idea of a good Letter much sooner in your Mind, but also give you a greater Freedom. The Lesser is, doubtless, always contained in the Greater; and he that attains to the writing any Hand, however large, may soon write it smaller, if Occasion requires.

4. Let all Strokes which are the constituent Parts of a Letter (or, as some call them, the Body-Strokes) be made with the Full of the Pen, and of the same Thickness one with another, as near as is consistent with the Nature of the Hand in which you write.

5. Let all Strokes which join the constituent Parts of Letters, or the Letters themselves together, be made with the Corner of the Pen, and as fine as the Hand will admit of; which Strokes must always have some Proportion to

the Body-Strokes, and must be thicker, or finer, according as the Character is greater or less

6. Turn not your Pen; neither alter the Position of your Hand, but let it move with a steady, easy Motion, and perform every Letter without Catchings and convulsive Flutterings.

7. Let the fine Strokes answer one another, in a Kind of Opposition; and, in many Hands, run nearly parallel.

8. Let all the Letters that have no Stems above or below the Line be even at the Top and Bottom. Let those which have Stems above the other Letters be equal in Length to the *l*, (the *t*, and a few other Letters in some Hands only excepted). Let those which have Stems below the Line be equal in Length to the *j*, some few excepted.

9. Let the Capital Letters be equal in Height to the little *l*, and a small Matter stronger.

10. Let the Distance between Words be twice as large as that between Letters.

And lastly, let the Lines be of such a Distance, that the Stems of the Letters may not interfere one with another; to prevent which, they must be at least twice the Length of an *l* asunder.



Of the Choice of PENKNIVES, and QUILLS for making of PENS.

IN order to make a good Pen, you must provide a good Knife; or if you have two, one for the *Shaping*, the other for *Nibbing*, you will find the Benefit of it, If the Blade be strong and large, you'll find it will take off the Nib the cleaner; the Weight of the Blade requiring less Pressure: The Edge ought also to be strait, and not too keen. The round-pointed Blades hinder the Nibbing of the Pen square; and if too keen, when nibbing a strong Pen, the Edge is apt to turn.

As to the Choice of Quills, great Quantities whereof are brought from several Counties in *England*, but more particularly *Yorkshire*, *Shropshire*, and *Lincolnshire*; the former of these are reckoned the best, as they are the clearest, and most substantial,

To make these natural Quills of greater Service, there are two Ways of manufacturing them, commonly called *dutching* or *clarifying* them. The first is effected by the Help of Fire; the last, by boiling them in Water, and then clearing them over a Charcoal Fire, or putting them into hot Sand. It may not be amiss here to remove an erroneous Notion which some good Penmen entertain, who imagine such Quills to be boiled in Oil; whereas, if that were the Case, the Ink would never flow from them: On the other Hand, this Method of clarifying them is to take out that oily Matter that is natural to raw Quills, which causes a spongy Nib after very little Writing. These Quills so manufactured, are of longer Duration than raw Quills, look better, and are in Reality of more Service for the Dispatch of Business.



The best Way of making a PEN.

IN order to make a good Pen, Care must be taken that the Slit be not forced so hard, as to gape or open; neither should the Nib be bent inwards; both these Deficiencies tending to the same bad End. The first causes the Pen not to cast Ink; the last, after a very little Use, occasions a double Stroke; and when the Nib is recovered from that forced Strain, the Slit opens not much unlike that which was forced too much. The Slit should be always easy and clear. Make each Cheek or Side of the Slit, as equal as possible, with a strait-bladed Pen-knife. Nib it quite even or square; the common Practice of making that Part next the Hand both narrower and shorter than the other, being a vulgar Error: For should the Nib in that Part be the narrowest, it must of Course be the weakest; and if it be the shortest, the other Part of the Nib must touch the Paper before it, and then you may as well have no Slit at all.

Make the Slit long or short, according to the usual Pressure of your Hand, whilst you are writing, and to the Strength of your Quill.

Take notice, that the manufactured Quills before mentioned have no Need of scraping to make them slit clear, as the raw Quills have; and they are apt to split too high,

unless prevented by placing your Thumb at the Height you would have the Slit to stop. The Cheeks are not to be made strong in a weak Quill, nor weak in a strong one; the principal Judgment, however, lies in the Slitting and the Nibbing. If the Quill be weak, the Slit must be something shorter; if strong, it matters not how long, in case the Cheeks are made in Propotion, so that, if used by an obedient Hand, it hath a Spring, and opens and shuts at Pleasure; as is evident in Striking, or Command of Hand.

Directions how to hold the PEN.

1. Hold your Pen with the Thumb and two first Fingers of your right Hand, so as that your second Finger's End may reach just to the upper Part of the Hollow or Scoop of your Pen: And that your Pen may rest on that Side of your second Finger (near the Nail) which is next your first Finger.
2. Your first Finger's End must reach just to the Top of the Nail of your second Finger, and lay hold or press on that Part of the Barrel of the Pen which is next your second Finger.
3. Your (Thumb almost extended strait) must lay hold or press on that Side of the Barrel of the Pen that is next it, and will then reach to the right against the Top of the Nail of your first Finger.
4. Your Pen and Hand thus ordered, your Pen will be held on the Right Side of it, (almost under the Barrel) by the End of your second Finger near its Nail.
5. On the Right Side (almost on the Back of the Barrel) it will be held by that Part of your first Finger, which is nearest your second Finger.
6. On the Left Side (about an Inch and a Quarter from the Point of the Nib) it will be held by the Ball of the End of your Thumb, traversing slant-wise opposite to the End of your Thumb Nail: And the feathered Part of your Pen will pass between the upper and next Joint of your first Finger; and the Hollow Scoop, or Opening of your Pen will be hid from your Sight.
7. The Hollow, or Palm of your Hand, will be almost directly against your Paper.
8. Your third Finger must bear upon your little Finger, near its End; but it must be brought more inward (or nearer your Left Hand) than your little Finger.
9. Your

9. Your little Finger must bear on your Paper with that Joint of it which is next the Nail.

10. The Ball of your Right Hand, near the Wrist, must not (or any Part of your Hand, but the before-mentioned Joint of your Little Finger) touch the Paper.

11. Your Pen and Hand ordered according to these Directions, you will find the Paper and Desk on which you write will be borne on by nothing else but the Nib of your Pen, the lowermost Joint of your Little Finger, that Part of your Right Arm which is between your Wrist and your Elbow, and by the Thumb, Fingers, and Part of the Arm, near the Elbow of your Left Hand; on which, and the Seat you sit on, the Weight of your Body should rest.



Instructions for sitting at your Writing.

LET your Seat be so high, as that you may sit easy, without either your Legs hanging, or throwing them from you. Let your Desk or Table be about the Height of your Middle. Thus seated, lay your Book or Paper awry; that is, let it incline towards your Left Arm or Side, instead of being strait before you. The more it inclines the more your Slope will be. If you write *upright*, then lay your Book or Paper *even* before you. Fix your Body directly before your Desk or Table, with both Right and Left Elbows on it; notwithstanding the general Method is, that your Left Arm only should rest thereon.

Thus seated, and having your Book and Paper before you, you may write with all the Freedom and Ease imaginable: No *Nervous Flutterings*, no Numbness, or Stiffness that a too frequent Sitting with the left Side towards the Desk or Table, and leaning the Stress of your Body on your Left Arm, occasions, will attend you. This Method will suit all Sizes; the Fat, or the Lean; the Tall, or the short; Men of Bulk, and Ladies laced in their Stays: They will write without Fatigue, and with a great deal of Freedom; and what is more, they will write *even* without *Leading-strings*, either Single or Slope Lines, or any other Aid or Assistance whatsoever.

The Inconveniencies that attend the common Method of sitting are very obvious. There are very few but what

find it difficult to write either even, or to keep a Line of an exact Height. The Reason of this is, because, as your Body inclines to the Left towards your Desk, you write from you, which causes you to *fall* in the *Evenness*, if you write without Lines: If you write with them, unless you follow your Writing, it declines at the End of the Line by stretching your Hand, and by not being directly under your Eye. Should you move your Body after your Writing too far, your Writing will become larger at the Close of the Line.

This Method will remedy these and all other Inconveniences, attending the common Posture in sitting, and laying your Book and Paper to write; for you have no Occasion to stir your Body, but sit at Ease, as in an Elbow Chair. Besides, the Fatigue in Writing is lessened, by having both Arms to ease you, laying an equal Weight on the Table or Desk to support your Body; the Right Hand directing the Pen towards the Corner of the Paper; and though it rises, it rises so gradually, that when you come to lay your Paper strait, your Writing will be as even as if performed with Lines. When you have wrote the full Length of the Stretch of your Fingers, your left Hand is employed in drawing the Paper towards your Body, and in pushing it from you when your Line is finished, to begin again.

Observe farther, that he who writes on a flat Table has the Advantage of him who writes upon a Desk that has too great a Slope, because the Ink is apt to recoil; and if the Flow of the Ink is thereby impeded, the Freedom, Beauty, and Sprightliness of the Writing must of Consequence be very much hindered, if not wholly lost.



Particular Instructions relating to the Round Hand and Italian.

FIRST, the young Penman should endeavour to make his Hand-writing as legible, expeditious, and beautiful as he can; for these three Qualities are what will render it most useful.

In order to render it legible, he should chuse for his Use, out of the various Forms that he meets with, such Letters as are most generally known and approved of.

He

He should never, out of a Vanity of Invention, add any Sprigging to them; neither should he throw Strokes thro' the Body of his small Letters.

To make his Hand-writing expeditious, he should principally use those Letters that are made in one continued Stroke, and that have in their Beginnings and Endings an Aptness to join with one another.

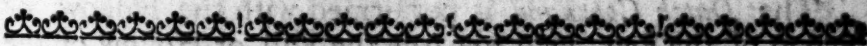
To make his Writing beautiful, he should make his Fulls and Smalls very smooth and clear; he should make the circular Strokes of his Letters without Corners or Flats, and the right-lined ones without Crookedness; he should keep such a Distance between his Letters, that the Whites between each of them may be as exact as is consistent with Practice, and take the same Care with respect to the Distance of his Words and Lines: For the Beauty of Letters consists in the well-adjusting of their Parts, well-performing the Strokes of which they are composed, and placing them to the best Advantage.

He should take Care, that all such Letters as have no Stems be made as nearly of a Height as he can; and the same Letters in the same Piece of Writing, as near as may be, of the same Proportion; he should perform likewise as much of a Word, as he can in one continued Stroke.

He should never make Use either of a Black or Red Lead-Pencil in striking of his Letters, but should learn to execute them fairly, without touching his Paper with any Thing but the Nib of his Pen, and let the Fulls and Smalls be made as the the Pen he makes Use of will naturally give them, without any After-touches. He should learn the leading Letters of each Hand first, and from them proceed to the others, which in a great Measure depend upon them.

The *Round-Hand* is composed of an oval and strait Line, and leans to the Right.

Its Fundamental Letters are *l, n, o, j.* The *Italian-Hand* is of the same Nature with the *Round*; with this Difference only, that it is somewhat narrower, for its Slope and Fundamental Letters are the same.



Directions for nibbing the Pen, and for sitting to write the Law-Hands.

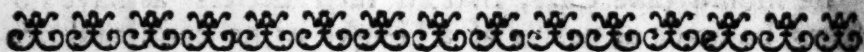
MAKE the Nib of your Pen square, as in the *Round-Hand*, but stronger, and shorter in the Slit. As
your

your Writing must be quite upright, sit strait, hold your Elbows out, and have your Parchment always even before you.

The Fundamental Letters of these two Hands are, *j, l, n, o, w.*

The *German-Text* is but little used, except by Way of Ornament, and cannot properly, therefore, be called one of the *Law-hands*. However, the Letters of it, though they are somewhat narrower than the *Square-Text*, stand perpendicular to the Line as that does, and its Fundamental Letters are, *j, o, l, n, w.*

Though 'tis customary, 'tis true, both in the *Square* and *German-Text*, to embellish the Capitals with a Variety of Strokes; yet there are no Rules to be prescribed in the Execution of them, since they are wholly dependent on the Fancy of the Penman; however, he ought to take Care that such additional Strokes be a real Ornament, and not a Blemish to the Letter he would endeavour to improve.



Directions for Striking, otherwise called Command of Hand.

STRIKING is called *Command of Hand*, because it is performed without the least Agitation of the Fingers, or resting on the Hand or Arm.

Some strike after the *English*, and others after the *Dutch* Manner; and both, if well executed, are beautiful enough when judiciously, and but sparingly introduced; but a vast Variety of Sprigs, Knots, and Birds, &c. are, in the Opinion of the best Performers, no Ornament to Writing at all.

The *English Command* is performed with the Hollow of the Pen turned towards the End of the Middle Finger, and is naturally light, airy, and genteel, and most agreeable for the *Italian* and running Round-Hand.

The *Dutch Command* is performed with the Hollow, or Scoop of the Pen, held towards the Ball or Hollow of the Hand, and is most proper for Letters in the Round-Hand, because the Fulls fall alike; the Pen being held as in Writing, only the Nib a little elevated.

The

The Center of Motion in Striking, is at the Shoulder, from whence let your Hand and Arm swing together with sprightly Motion, without resting, or touching the Paper with any Thing but the Pen, which must not be turned in the Hand whilst you are making of any Stroke.

The slower your Motion is, the surer it will be; but yet there must be such a Boldness and Freedom observed, that the Stroke may be smart and clean, without Roughness, Flatness, or Corners.

Note, The Pen for *Dutch Command of Hand* is the same with that for the *Round-Text*; and for the *English Command*, the same with that for the *Italian-Text*.



Directions for the making of Figures.

THE making of Figures well, is as necessary, as the making of Letters well; for without Figures, no Affairs in common Business can possibly be transacted; and for that Reason I would advise all such as would be thought duly qualified for any Employment whatsoever, to make their Figures in the most graceful Manner that they can.

Figures, that stand in Columns in Books of Accounts, let them be upright; but if they be mixed with Letters in Writing, let them lean.



WRITING-MASTERS should not give their Scholars idle, silly Copies, which have no Sense in them, but such as inculcate Virtue; for what we learn in our younger Years, sinks deep in the Memory, adheres to us till old Age, and has a prevailing Influence over all our Conduct. In the Prosecution, therefore, of these Directions, I shall make it my Business to extract, from the Writing of the politest and most approved Authors, both Antient and Modern, such sententious Precepts, and Rules of Life, both in Prose and Verse, as may be not only proper for my young Pupils Imitation and Improvement in the Art of Penmanship; but, if committed to the Memory, may prove a Guide for their future Conduct, and may contribute, in some Measure, not only to their Success here, but their Happiness hereafter.

Select Copies, consisting of single Lines, and digested into Alphabetical Order.

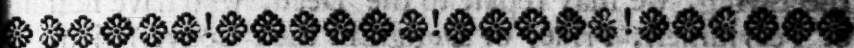
FIRST SET.

- A. **A**R T polishes and improves Nature.
- B. Beauty's a fair but fading Flower.
- C. Content alone is true Happiness.
- D. Delays often ruin the best Designs.
- E. Encouragement is the Life of Action.
- F. Fortune is a fair, but fickle Mistress.
- G. Grandeur alone is no true Happiness.
- H. Health is Life's choicest Blessing.
- I. Idleness is an Inlet to every Vice.
- K. Knowledge is a godlike Attribute.
- L. Liberty is an invaluable Blessing.
- M. Modest Merit finds but few Admirers.
- N. Necessity is the Mother of Invention.
- O. One bad Sheep infects the whole Flock.
- P. Pride is a Passion, not made for Man.
- Q. Quick Resentments prove often fatal.
- R. Riches are precarious Blessings.
- S. Self-Love is the Bane of Society.
- T. The Hope of Reward sweetens Labour.
- V. Variety is the Beauty of the World.
- W. Writing is a fine Accomplishment.
- X. 'Xcess kills more than the Sword.
- Y. Yesterday mispent can never be recall'd.
- Z. Zeal misapplied is pious Phrensy.

SECOND SET.

- A. **A**ffectation ruins the fairest Face.
- B. Beauties very seldom hear the Truth.
- C. Conscious Virtue is its own Reward.
- D. Dreams are the Pastimes of Fancy.
- E. Envy too often attends true Merit.
- F. Fame, once lost, can never be regained.
- G. Good Humour has everlasting Graces.
- H. Humility adds Charms to Beauty.
- I. Innocence is ever gay and chearful.
- K. Knowledge procures general Esteem.
- L. Love hides a Multitude of Faults.
- M. Modesty charms more than Beauty.

- N. Nothing is more valuable than Time.
 O. Order makes Trifles appear graceful.
 P. Praise is grateful to human Nature.
 Q. Quick Promisers are often slow Performers.
 R. Recreations are not only lawful, but expedient.
 S. Shame attends unlawful Pleasures.
 T. Truth needs no Disguise or Ornament.
 V. Vanity makes Beauty contemptible.
 W. Wisdom is more valuable than Riches.
 X. 'Xamples prevail more than Precepts.
 Y. Youth, like Beauty, very soon decays.
 Z. Zeal warms, and enlivens Devotion.



Select Sentences, Moral and Divine, alphabetically digested.

The FIRST SET.

A.

A Man of great Abilities may, by Negligence and Idleness, become so mean and despicable, as to be an Incumbrance to Society, and a Burden to himself.

B.

Beware of Drunkenness. It impairs the Understanding, wastes the Estate, banishes the Reputation, consumes the Body, and renders a Man of the brightest Parts, the common Jest of an insignificant Clown.

C.

Contentment is the most precious Jewel of human Life; and the Way to attain it is, the surmounting Difficulties by curbing vicious Inclinations, fierce unruly Passions, and inordinate Appetites, in overcoming Temptations, and in bearing Injuries with Patience.

D.

Disdain not your Inferior, though poor; since he may possibly be much your Superior in Wisdom, and the noble Endowments of the Mind.

E.

Envious Persons are for the most Part ungrateful, mean, proud, impotent, and malicious: They lie under a double Misfortune: Common Calamities and common Blessings fall heavy upon them: Nature gives them a Share in the first, and their Ill-Nature in the latter; and having their own

own Trouble, and the Happiness of their Neighbours to disturb them, they need no other Ingredients of Misery.

F.

Fame and Opportunity have swift Wings; and the Difference is, that the former goes forward, but the latter backwards: She must therefore be taken by the Forelock; for Occasion past is irrecoverable, and the Loss by Neglect is irreparable.

G.

Good Books are a Guide in Youth, and an Entertainment for Age; they support us under Solitude, and keep us from being a Burden to ourselves: When we are weary of the Living, we may repair to the Dead, who have nothing of Peevishness, Pride, or Design in their Conversation.

H.

He that neglects Religion, to pursue the vain Pleasures of Life, makes his Address to a Shadow; and the more he pursues the admired Trifles, the more it flies from him.

I.

Idleness is the greatest Prodigality; it throws away Time, which is invaluable in respect to its present Use; and when it is past, cannot be recovered by any Power of Art or Nature.

K.

Keep your own Secrets; for if you discover them to another, and he reveals them, you should pardon him for it, since he is only treacherous by your Example.

L.

Let Virtue and Innocence always accompany your Recreations; for unlawful Pleasures, though agreeable for a Moment, are always attended with bad Consequences, and, instead of relaxing the Mind, plunge us into an Abyss of Trouble and Vexation.

M.

Much Prudence is required in the Choice of your Companions: If you desire Refreshment, associate yourself with your Equals; but if Profit, with your Superiors. It is always the sure and certain Mark of an abject Temper, to be ambitious of being the first of any Company whatsoever.

N.

Necessity is the Mother of Invention, and Encouragement the Nurse of it: What is brought forth by the one, should be propagated by the other.

Observe

O.

Observe the various Actions and Tempers of Men, and pass by human Infirmities with a generous Greatness: Criticise upon nothing more than your own Actions, and you'll see Reason enough to pardon the Weakness of others.

P.

Pride hides our Faults from ourselves, and magnifies them to others: It will make a Man dictate to his Superiors, of whom he ought to learn; and rather than not appear wise, chuse to continue ignorant.

Q.

Quarrels are too often raised about the meekest Trifles; and yet, when once begun, are with the greatest Difficulty imaginable brought to a friendly Conclusion.

R.

Reputation is like Fire; when once you have kindled it, you may easily preserve it; but, if once you extinguish it, you will not easily kindle it again; and if you should, it may burn a little, but it will never blaze.

S.

Shame, Diseases, Disappointments, and self-condemning Reflections, are the common Punishment of Sloth: But Success and Riches generally attend an unwearied Diligence and Application to Business.

T.

The best need Afflictions for the Trial of their Virtues: Should all Things succeed to our Wishes, how should we shew our Readiness to forgive others, as we ourselves desire to be forgiven?

U.

Use your Prosperity with so much Caution and Prudence, as may not suffer you to forget yourself, or despise your Inferior; and consider, whilst you enjoy much, how little you deserve.

W.

We may as well expect, that God should make us rich, without the least Diligence or Application, as make us good, without the Concurrence of our own Endeavours.

X.

'Xcess destroys more than the Sword. *Alexander*, when inflamed with Wine, cut off his best Friend, and executed in one unguarded Moment what he repented of all his Life after.

G

Youth

Y.

Youth is rash and precipitant : Whilst the Blood runs thro' the Veins with great Rapidity, the Passions are strong and unruly, and the Mind too loose and airy to be guided by the wise Counsel of the aged ; and the Knowledge of themselves, comes often too late to prevent their Ruin.

Z.

Zeal, when groundd upon Knowledge, and guided by Prudence and Charity, gives such a Life and Vigour to Devotion, that all who see it so exerted must applaud it.



Select Copies in easy Verse, alphabetically digested.

A.

ALL human Things are subject to decay,
And when Death summons, Monarchs must obey.

B.

Brave Deeds, and Virtue (when 'tis spotless) have,
Glorious Rewards, that shall out-live the Grave.

C.

Censure not rashly ; Nature's apt to halt :
Look inward : He's unborn that has no Fault.

D.

Do thou with Pleasure own thy Errors past,
And let each following Day excel the last.

E.

Envy will merit, as its Shade, pursue ;
But, like a Shadow, proves the Substance true.

F.

First worship God : He that forgets to pray,
Bids not himself Good-Morrow, nor Good-Day.

G.

Greatness by Virtue's only understood :
Not one is truly great, that is not truly good.

H.

He's rich who never covets worldly Pelf ;
He's poor, who has enough and starves himself.

I.

Immodest Words admit of no Defence ;
For Want of Decency is Want of Sense.

K.

Know this one Truth, (enough for Man to know)
Virtue alone is Happiness below.

Live

L.

Live well, and then how soon foe'er you die,
You are of Age to claim Eternity.

M.

Manners with Fortunes, Humours change with Climes,
Tenets with Books, and Principles with Times.

N.

No Minutes surely bring us more Content,
Than those in pleasing, useful Studies spent.

O.

Our Reformation never can prevail,
While Precepts govern, and Examples fail.

P.

Pride is the never-failing Vice of Fools,
The Wise and Virtuous walk by humble Rules.

Q.

Quarrels, and Strife, and Law-Suits wisely shun:
By Peace and Silence, no Man is undone.

R.

Remember Death; think every Day your last;
Lament all Vanities and Follies past.

S.

Safe in thy Breast close lock up thy Intent;
For he that knows thy Purpose, best prevents.

T.

They cannot want who wish to have no more:
Who ever said an Anchoret was poor?

V.

View all the habitable World! How few
Know their own Good, or knowing it pursue.

W.

Want is the Scorn of every wealthy Fool,
And Wit in Rags is turn'd to Ridicule.

X.

Xerxes survey'd his mighty Host with Tears,
To think they all must die in threescore Years.

Y.

Yesterday's past; To-morrow's none of thine:
To-day thy Life to virtuous Acts incline.

Z.

Zeal is a Fire, and useful in its Kind:
But nothing is more dangerous, if blind.



Select Sentences, Moral and Divine, in Prose, alphabetically digested.

The SECOND SET.

A.

ACTION keeps the Soul in Health; whereas Idleness rusts the Mind, and corrupts as well as benumbs all its active Faculties.

B.

Beware of the Man that has no Regard to his own Reputation; since it is not probable he should have any for yours.

C.

Could we rightly and duly reflect on the Misfortunes of other Men, we should be much more thankful than we are for the many undeserved Blessings which we daily enjoy.

D.

Do not speak reproachfully of any Person whomsoever; for such Injuries are very seldom, if ever, forgotten, and may possibly prove a Hindrance to your Preferment.

E.

Education either makes or mars us; and Governments as well as private Families, are concerned in the Consequences of it.

F.

Faith may sometimes exceed Reason, but not oppose it; and Belief may be often above Sense, tho' not against it. Beware therefore not only of an implicit Faith, but of being too closely tied up to Reason, where Faith is required.

G.

Give your Heart to your Creator; pay due Reverence to your Superiors; honour your Parents; give your Bosom to your Friend; be diligent in your Calling, let your Condition of Life be what it will; give an attentive Ear to good Advice; and be liberal to the Poor.

H.

Humility is the grand Virtue that leads to Contentment: It cuts off the Envy and Malice of Inferiors and Equals, and makes us patiently bear the Insults of Fools above us.

If

I.

If you would avoid Sin, fly Temptations; he that will not use his utmost Endeavours to avoid the one, cannot expect Providence should defend him from the other.

K.

Keep a just Account at the Entrance of your Estate: You may rise with Honour, but you cannot go back without Shame; for a good Beginning makes a good Ending.

L.

Let your Promises be sincere, and so prudently considered, as not to exceed the Reach of your Ability: He who promises more than he can perform is false to himself; and he who does not perform what he has promised is false to his Friend.

M.

Make not your Neighbour's Fault appear greater than it is, nor your own less; for to excuse your own Fault is to double it, and to aggravate another's by Detraction, is to make it your own.

N.

Nature is nothing but the Voice of God: A bright Display of that divine Wisdom, which demands an eternal Tribute of Wonder and Worship.

O.

Our present Time ought to be managed with a judicious Care; since we cannot secure a Moment to come, nor recal the least Part of one that is past.

P.

Put forth all your Strength in honouring of God, and doing his Commandments; for that Time shall end in a blessed Eternity, that is prudently and zealously spent in the Service of the Supreme Being.

Q.

Quietness carries its own Reward along with it. Have an Aversion to all Debates; study to inform your Mind, and reform your Life.

R.

Recreation after Business is allowable; but he that follows his Recreation instead of his Business, shall in a little Time have no Business to follow.

S.

Solon made a Law that those Parents should not be relieved

lieved in their old Age by their Children, who did not take Care to give them a virtuous Education.

T.

That Man who fears God is the wisest Man; and he that departs from Evil has the best Understanding.

V.

Virtue is the Beauty of the Mind, and the noblest Ornament that Mankind can boast of. It stirs up our Reason when our Senses err, and is then our greatest Safeguard.

W.

Whoever wisely considers the Miseries of human Life will certainly prepare for a better; since Infancy is attended with Weakness, Youth with Disorder, and Age with Infirmity.

X.

'Xcuse what you see amiss in others; since all Mankind are liable to Errors.

Y.

Your Poverty will never prove a Disgrace to you, unless you hasten to be rich by any illegal Proceedings.

Z.

Zeal in a good Cause is very commendable; but whenever it is blind or neglected, it is very pernicious.



Select Copies, consisting of four, six and eight Lines.

I.

BEAUTY, like Ice, our Footing does betray;
Who can tread sure on that smooth slippery Way?
Pleas'd with the Passage, we slide swiftly on,
And see the Danger, which we cannot shun.

II.

There is a Lust in Man no Charm can tame,
Of loudly publishing his Neighbour's Shame;
On Eagle's Wings immortal Scandals fly,
While virtuous Actions are but born and die.

III.

Virtue's the chiefest Beauty of the Mind,
The noblest Ornament of Human-kind;
Virtue's our Safeguard, and our leading Star,
That guides our Reason when our Senses err.

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IV.

Children, like tender Oziers, take the Bow,
And as they first are fashion'd always grow:
For what we learn in Youth, to that alone,
In Age we are by second Nature prone.

V.

Cadmus did first the wond'rous Art devise,
Of painting Words, and speaking to the Eyes;
By various Lines to curious Order brought,
Body and Colours were giv'n unto Thought.

VI.

None, none descends into himself, to find
The secret Imperfections of his Mind.
But ev'ry one is Eagle-ey'd to see
In any other a Deformity.

I.

Great was that Genius, most sublime that Thought,
Which first the curious *Art of Writing* taught:
This Image of the Voice did Man invent,
To make Thought lasting, Reason permanent:
Whose softest Notes with Secresy can roll,
And Mysteries proclaim from Pole to Pole.

II.

Happy the Man, of Mortals happiest he,
Whose quiet Mind from vain Desire is free:
Whom neither Hopes deceive, nor Fears torment,
But lives at Peace, within himself content;
In Thought or Act accountable to none,
But to his Conscience, and to God alone.

I.

Dreams are but Interludes which Fancy makes,
Whilst Monarch Reason sleeps the Mimick wakes;
Compounds a Medley of disjointed Things,
A Court of Coblers, and a Mob of Kings.
Light Fumes are merry, grosser Fumes are sad,
And both the reasonable Soul run mad;
And many monstrous Forms in Sleep we see,
That never were, nor are, nor e'er shall be.

II.

Such is the gloomy State of Mortals here,
We know not what to wish, or what to fear.
What then remains? Are we deprived of Will?
Must we not wish for fear of wishing ill?

Receive my Counsel, and securely move ;
 Entrust thy Fortune to the Pow'rs above :
 Leave them to manage for thee, and to grant
 What their unerring Wisdom sees Thee want.



*Some General Directions in regard to Epistolary Writing;
 with Select Forms of Address and Business.*

THE Style peculiar to such Letters as consist only of Compliment, Wit, and Address, should be always gay indeed, but free and easy, void of all studied Graces, and as near a Copy of Nature as possible.

On the other Hand, That of the Tradesman should be short, plain, and pertinent to the Occasion, without any Flights of Fancy, or Deviations from his principal Design. He should imagine himself in Conversation with his Friend on the *Royal Exchange*, and express his Sentiments in such clear Terms, that his Correspondent should not be capable of the least Doubt or Hesitation with respect to his Orders. And as he ought never to be obscure so he should industriously avoid all Manner of Abbreviations, which have a natural Tendency to render his Expressions either too general, or ambiguous. Nothing therefore in his Letter should be presum'd, understood, or implied. His Intentions should be comprehended at the first View; for whenever Instructions are given but darkly, and by Hints only, some Error of Consequence may pass through Misconstruction.

The Correspondent, likewise, on his Part, should take particular Care to be as punctual, clear, and free from Ambiguity, in all his Answers. He should weigh every Article maturely, and give it a distinct and direct Reply. Nothing, in short, should be omitted; no one Particular should be left in Suspence, lest his Correspondent, for want of proper Intelligence, should suffer either in his Character or his Fortune.

L E T T E R I.

From one Cousin to another.

Dear Cousin Polly,

TIS with no small Pleasure that I write to you by the joint Command of my Papa and Mamma to en-
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quire after your Health, and all our other Relations in the Country. You hadn't been gone from our House above a Day or two, before I was very dull for want of your good Company. However, as I know you have not your Health in our nasty smoaky Town, it would be very unkind in me to desire you to return, and run the Risque of a second Illness. Pray let us know how you spend your Time in the Country, and in Return, you may expect to hear what passes at our next Ball here in Town, which will be very gay, and comes on in about a Fortnight. I am,

Your affectionate Cousin,

T. D.

LETTER II.

Miss Polly's Answer.

Dear Cousin Tommy,

I Had the Favour of your friendly Letter, and am greatly obliged to you Sir, as well as to your good Papa and Mamma, for enquiring after my Health. I am much better since I came into the Country; and Mr. *Mearwell* the Apothecary, gives me Hopes of a speedy Recovery. I go abroad every Day to divert myself; but the Woods and Gardens are not near so chearful and inviting this Spring, as they were the last, when we had the Pleasure of your good Company. However, as your Papa has now bought you a little Poney, and the Weather is like to continue fine, I please myself with the Thoughts of seeing you in a few Days; for I don't at all doubt but the Letter I sent by *William* will procure the Consent of my good Uncle and Aunt, and I have Reason to believe, Sir, that you will be willing to pay a Visit to

Your affectionate Cousin, M. G.

LETTER III.

From a Brother in Town to his Sister in the Country, complaining of her Neglect in Writing.

Dear Sister,

YOUR Friends, I can assure you, take it very ill, that you give them no Account of your Health, or the Manner in which you spend your Time in the Country. You cannot be insensible, that you have several Admirers here in Town, and that they are impatient for your Return. Can your long Silence, therefore, think you be any ways excused with a good Grace? My Mother, I

can

can tell you, is highly displeased, and so are my Uncle and Aunt. For my Part, I have acted the good-natur'd Brother so long, and formed so many Excuses for you that I am quite tired. Take care therefore for the future and deserve a better Character. Write to us soon and often, and I don't doubt but I shall procure your Pardon for the Offences past. You may depend on it, 'tis with no small Pleasure that I subscribe myself,

Your very affectionate Brother,

E. D.

LETTER IV.

The Sister's Answer.

Dear Brother,

THE Charge you have brought against me is, I own a little too just. I have been negligent indeed; but pray assure my dear Mother, and my Uncle and Aunt that my Silence has not been owing to the least Want of Duty or Respect, and that I'll never be guilty of the like Fault again. Be my Advocate, dear Brother, for once, upon this my sincere promise of Amendment. I know you are good-natur'd, and that my Relations, if you but plead in my Behalf, will sign my Forgiveness. If you'll excuse the Shortness of this Letter, you shall have a longer next Week, with a full and true Account of my Visit to my Lady *Notable*, and the kind Reception I met with from the whole Family. I have nothing to add at present but my Duty and Respects where due, and to assure you, that I am proud to subscribe myself,

Your affectionate and much obliged Sister, E. D.

LETTER V.

From an elder to a younger Brother, representing to him the fatal Consequences that must unavoidably attend him, in case he persists in his Extravagance.

Dear Billy,

AS you are my only Brother, you must imagine, if you give yourself the least Time for Reflection, that your Misfortunes affect me next to my own. You are sensible I have met with too many; but then you know very well, at the same Time, that they must be ascribed to unforeseen Accidents, and not to any wilful Acts of Profusion. This Consideration supports me under the Weight of them; but as to those that have befallen me on your Account, they must be imputed indeed to my Indiscretion. Whilst

my

My Father and Mother were living, they both supplied you, not only with the Conveniences of Life, but indulged you; I may be so free as to say so, in your Levity and Extravagance. They are both dead, and what they left behind them, 'tis true, is now devolved upon me. Not only Nature, but Providence, directs me to make the best Use possibly can, of what is thus thrown into my Possession. My Love for you inclines me, I must own, to serve you to the utmost of my Power; but, dear *Billy*, which Way can I effectually do it? The frequent Supplies that our indulgent Parents sent you, gave you no substantial Assistance; they were thrown away upon you: And what Measures, I pray, am I to take to screen you from Distress? You might have been happy long ere this, had you made but a good Use of your Friends Readiness to serve you; but give me leave to speak my Sentiments freely, your present melancholy Situation is wholly owing to your own Imprudence. You might have lived comfortably, with good Management, all your Life-time, on your own Fortune; but 'tis plain, it has not maintained you much above a Twelve-month. Were I able, or willing, to add as much more to it, what just Grounds have I to expect that you will be a better Oeconomist than hitherto you have been? All I have, at your Rate of living, would support you, Brother, but a very few Years; and I must think it my Duty (whatever you may imagine) to take care of my own Family as long as they live, and am determin'd so to do, if no unforeseen Accident prevents me. Were I to send you the hundred Guineas according to your Request, of what real Advantage would it be to you? It would prove of no other Service in the World, than to lengthen your Credit, and make you run deeper into Debt. How often have I assisted you already? And has not the Case been always the same? Have not several with whom you have Dealings, given you Credit from Time to Time, because they imagin'd that I would support you, and discharge their Bills? As therefore all my Indulgence towards you has proved ineffectual, 'tis Time now to withdraw my Favours. However, notwithstanding all your repeated Provocations, you may assure yourself, when I have any convincing Proof of your Reformation, no reasonable Assistance will be denied you, by

Your affectionate, tho' much injur'd Brother, A. Z.
L E T.

LETTER VI.

From a Guardian to his Ward, on his irregular Course of Life during his Apprenticeship.

Dear Dicky,

YOU are not insensible of the true Love and Friendship that always subsisted between your affectionate Father and myself: And as he was pleased to constitute me the sole Executor of his last Will and Testament, and therein charged me, in the warmest Terms, to have a watchful Eye over your Deportment during your Minority, 'tis with the utmost Concern, that I hear you have entered yourself a Member of a loose disorderly Club; that you have too little Regard for your Reputation; are often disguised in Liquor: keep bad Hours, break the Rules of your Master's House at least twice a Week; and in short, make the whole Family very uneasy. I have been informed, moreover, that, if my old Friend does but expostulate with you on the Occasion, even in the coolest Manner, you treat him with that Indecency that no Ways becomes you: You give him, it seems, such peremptory Answers, and put on such saucy Airs, as are insufferable; and, in short, instead of being submissive, and giving him the least Prospect of a future Amendment, you repeat the Offence for which he checks you, and make his wholesome Admonitions the Topic of your Ridicule amongst your profligate Companions.

As this is the true State of the Case; and as your good Father has been pleased to invest me with an Authority over you during your younger Years, give me leave to expostulate with you on this unhappy Occasion, and set before you, in a fair and impartial Light, the fatal Consequences that must too soon attend you, without a speedy Reformation.

In the first Place, how can you, in Conscience, break through all those Laws which you had so voluntarily bound yourself, by the most solemn Contract, faithfully to observe? How can I, think you, look your Master in the Face, who stand engaged to him in a very considerable penal Sum for your Integrity and good Behaviour? Can you think it honest to violate such Engagements? Consider you are but Eighteen, and 'tis time enough in Conscience, when you are One or Two and Twenty Years of Age, to be your own Master, and act without Controul. Stay

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till then at least, before you take such unreasonable Liberties, and keep such bad Hours, as well as bad Associates: And, in case you go on as you begin, I have too just Grounds to fear, you will even then prove equally indiscreet, and have a Taste for the same vicious Course of Life.

Consider, I beg of you, before 'tis too late, what Inconveniencies these ill Habits in Time may lead you to: Consider, I exhort you, the Anxiety, the Trouble, which you give your sincerest Friends by your Perseverance in your evil Ways. Reflect with yourself, and do as you would be done by. Is your Conduct at present such as you would countenance and allow, were you a Master yourself? Are you so capable of pursuing your Business, and promoting your Interest the next Morning, with that Life and Vigour, as if you went to Bed sober, and in due Time? If not, are not your mis-spent Evenings a double Disadvantage to your Master? Will not your taking what you call small Liberties at present, lead you on, in Process of Time, to take much greater? 'Tis not, let me tell you, in every one's Power to stop when he pleases; and who knows, but at last you will arrive at such a Pitch of Obduracy, as to be subject to no Manner of Restraint?

For my own Part, I think I may presume to say, I served seven Years myself, not only with Pleasure, but with Reputation. I thought likewise, though my Apprenticeship was not expired till I was two and twenty, that I was my own Master full soon enough. What your Thoughts may be on the like Occasion, I can't say; but I wish you may hereafter consult your own Interest and Credit, as I have done mine before you. Give me leave to tell you freely, that I should never have thought it either reputable or honest, to take such Liberties as you do.

You are now at an Age, when, instead of indulging yourself in your Pleasures, you should study to cultivate and improve your Mind. By applying to proper Books, you will qualify yourself for the best of Company; very much contract your daily Expences; fill up your vacant Hours, avoid a World of Temptations; and, in a Word, you will look down with an Eye of Pity on those frothy Companions, with whom you seem now to associate with so much Eagerness and Delight.

As nothing but my sincere Regard for your future Happiness and Welfare could induce me to expostulate with

H

you

you on this Breach of your Conduct, I hope that my friendly Admonitions will have the desired Effect, and that, by your speedy Amendment, I shall have no Cause to repent of taking on me the important Trust which your Father has reposed in me. Should your Master, as I hope he will, send me Word of the Success of these Remonstrances, you shall want for no Encouragement from, *Cousin,*

Your affectionate Guardian,

L. S.

LETTER VII.

From a Tradesman in London, to his Country Correspondent begging the Favour of a speedy Adjustment of Accounts between them.

S I R,

AN unforeseen Accident has happened, that obliges me to beg of you to settle the Account that stands between us. We have had Dealings together long enough, I hope, to be free with one another on any emergent Occasion. I would not have made my Application indeed had I a Friend in Town, on whose Assistance I could so safely depend. If it will be any Prejudice, however, in the least to your Affairs to discharge the Whole, the Remittance of forty Pounds, or such other Part only as you shall think proper, will be of singular service at this critical Conjunction, and lay a particular Obligation on,

Sir, Your most humble Servant, &c.

LETTER VIII.

The Correspondent's Answer.

S I R,

IAM very sensible some Exigence more than ordinary must have occasioned the Demand you made; and am therefore sincerely glad, that it lies in my power to answer your Expectations without any farther Application. Our Carrier sets out next *Wednesday*, and I shall order him to deliver you a Bank Note for Fourscore Pounds. As to the Residue, it shall be returned you within a Fortnight at farthest; at which Time I propose to give you a fresh Order, and commence a new Debt. I shall let you know what Credit I expect, and take care to make you punctual Payment. I am, Sir,

Your sincere Friend, and humble Servant.

LET.

LETTER IX.

From a Servant to his Master in the Country.

S I R,

AS I perceive your Affairs are likely to detain you longer Abroad than you promised when you went from Home, I thought myself obliged in Point of Duty to inform you, that all your good Family are in perfect Health; and that, as to the Business of the Shop, you may assure yourself, each Branch of it shall be carried on with as much Care and Fidelity, as if you were there in Person. Every body longs for your Return, as soon as your Affairs will any ways permit: My good Mistress in particular, begins to be impatient. In the mean time, however, you may depend on having immediate Notice, if any thing material occurs, from,

Sir, Your faithful Servant,

P. E.

LETTER X.

To a Correspondent.

S I R,

I Have received yours of the fifth of February last, with your Invoice and Bill of Lading inclosed. I shall remit you by the next Post 100 *l.* Bank Note, and beg the Favour of you to send me by *(Aaron Hill)* our Carrier, the first Opportunity, ten Pieces of Superfine Black Cloth, at about 15 *s.* per Yard, and thirty Pieces of Scotch Holland, about 3 *s.* or 3 *s.* 6 *d.* per Yard, as your Judgment shall direct you. I am, Sir, Your humble Servant,

P. G. *per m*

LETTER XI.

The Correspondent's Answer.

S I R,

YOURS, of the 20th of this Instant March, lies now before me; as also another of the 30th, with a Bill for 150 *l.* which is paid, and placed to Account, I have this Day, according to your Order, sent the Black Cloth and Holland, and doubt not but they will please you at the Price in the Bill inclosed. I am, Sir, &c.

LETTER XII.

To a young Tradesman, too apt to be in a Hurry in the Prosecution of his Business.

Cousin John,

THE great Regard I have always had for you, not only on your own Account, but for the dear Re-

membrance likewise of your good Father and Mother, both lately deceased, to whom I was greatly indebted for their many Favours, is the only Motive that induces me to trouble you with the following cursory Hints, which I flatter myself, you will receive with the same Candour and good Humour as I intend them.

I have called, Cousin, upon you, Time after Time, and have always found you, 'tis true, where you ought to be, in your Shop; but then I perceived you were always in such a Flutter and Confusion, that I could never have an Opportunity to talk with you freely, as I proposed, when I paid my Visits.

It must be acknowledged, that on some particular Occasions, a more than ordinary Hurry and Fatigue in Business cannot possibly be avoided; but that can never be always the Case, in my Opinion, with the most extensive Dealer. The great Art of Trade lies, Cousin, as I take it, in the judicious Disposal of a Man's Time, be his Occupation or Calling what it will.

Most young Traders, indeed, are fond of appearing mighty busy, imagining they shall be observed, and applauded for their Industry and Application; but, in my humble Opinion, those Flutters are rather the Effect of Indolence, and a too great Neglect of their Business at proper Seasons; and, as a Confirmation of what I have asserted, I shall only lay before you the daily Practice of an unfortunate Shopkeeper of my intimate Acquaintance, who was remarkable for driving his Business on with the utmost Precipitation.

My Friend, 'tis true, some few Years, carried on a very advantageous Business; but then, at last, under the usual Pretence of promoting Trade, indulged himself every Evening, in meeting with a Set of Bottle-Companions at the Tavern; and very seldom, if ever, neglected those social Engagements.

In order therefore to be punctual there, and make his personal Appearance as soon as possible, the Business of the Day was all Hurry and Confusion. Though he did not keep excessive late Hours, yet he was no Starter, and seldom got home till Eleven or Twelve. The Night thus spent, and the Bottles all empty, the Morning, which is the most precious Part of the Day, was spent in Indolence and Ease. If the most valuable Customer he had came to his

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his Shop before Nine, the Maid durst not disturb him. His Apprentice, indeed, would beg the Favour of them to call again; and when his usual Hour of Rising came, so many different Matters wanted to be discharged, that he was in one continued Ferment till about Two, at which Time he went to Dinner. Little after that was done; for he indulged himself in an elegant Way of Eating, as well as Drinking; off he went to the Tavern, and this Course he pursued for some considerable Time.

Thus, though he never applied himself regularly to Business above four Hours in the Day, he would be constantly complaining of Business lying too heavy on his Hands; that 'twas with the utmost Torment he went thro' it; and his Life, in short, seem'd to those who observed him only whilst behind the Counter, one continued Scene of Industry and Fatigue.

Now, Cousins, had he made it his Custom to rise at Six, and get himself dress'd, and ready for his Shop by Seven, all his Business would have every Day been reduced within a narrow Compass by twelve. In the first two Hours he would have met with but little, if any Interruption; and by such a Practice he might have improved his Servants by his own good Example; have given them the necessary Directions for the whole Day: and had Time sufficient besides, not only to have inspected his Books, but to have written to all his Correspondents; and by that means have disposed all Things in such an Order, that whatever Business occurred afterwards, whether more or less, might have served him only for an Amusement.

But not to dwell too long on my Story, what was the Result, think you, of my Friend's great Hurry and Precipitation? Why, he met with some Losses and Disappointments in Trade, (as who does not?) and his Customers not seeing him in the Shop in the Morning, and always in a Flutter when he was there, his Business insensibly dwindled away; his Creditors began to suspect him; and he had the Mortification, on the Adjustment of his Accounts, that had too long lain by neglected, to find the Balance of 3000*l.* to his Disadvantage, to quit a Business he had managed with so much Imprudence, and to live upon a Charity which his Friends procured for him, and afforded a bare Subsistence only for himself. I leave you to judge of the Misfortunes that must by Consequence attend his

poor Wife and Children, who built their Dependence upon him.

This Instance, I hope, Cousin, will afford you a Lesson of Instruction; and, as I have a good Opinion of your Prudence, I doubt not but you'll endeavour to correct the Fault which I have too often observed, and taken at this Time the Liberty to reprove.

I could not forbear giving you this Caution, lest you should postpone that to another Day, which might and ought to be done in this; and by such a Delay be unable to keep your Business within due Bounds. Method, dear Cousin, next to Industry and Application, is every thing in any Occupation whatsoever. By falling into a regular Way, you will always be calm, free, and easy; and have Time sufficient to amuse your female Customers, who are for the most part pretty tedious in making their Bargains, and will be humour'd as well as courted to a Compliance. And how, think you, must any Man be capable of behaving thus, as 'tis his Interest always to do, in case he prefers his Bottle to his Shop, and indulges himself in his Bed, when he should be in his Business? As you are very sensible, I have no other Ends in View than your future Welfare and Success in the World, I am well assured you'll take these cursory Admonitions in good Part, from, Sir,

Your sincere Friend and affectionate Cousin, M. C.

HAVING thus given our Readers a transient Idea of the Stile or Manner in which they ought to indite their Letters of Mirth and Gaiety, as well as those of Trade and Commerce; and having added thereto some few Copies for their Practice and Imitation, we flatter ourselves, as young Persons are too liable to Mistakes for want of proper Information, in regard to such as are either in Office, or of elevated Birth and Fortune, that it will be deem'd a proper, as well as natural Conclusion of this our present Undertaking, to instruct them how to direct to, and pay their Addresses in due Form, and with Propriety, to their Superiors, however dignified and distinguished either in Church or State.

TERMS of ADDRESS.

To the Royal Family.

To the King's most excellent Majesty. *Sire, or May it please your Majesty.*

To

To his Royal Highness George Prince of Wales. *May it please your Royal Highness.*

N. B. The like to all the rest of the Royal Family, Male or Female, *mutatis mutandis*, that is, changing what is necessary to be changed.

To the Nobility.

To his Grace the Duke of S. *My Lord Duke; your Grace.*

To the most noble Peter, Marquis of S. *My Lord Marquis; your Lordship.*

To the Right Hon. John, Earl of S. *My Lord; your Lordship.*

To the Right Hon. J. Lord Viscount M. *The same.*

To the Right Hon. P. Lord O. *The same.*

N. B. Here observe, that Noblemens Wives are address'd equal to their Husbands Dignity.

That all the Sons of Dukes and Marquisses, and the eldest Sons of Earls, have the Titles of Lord and Right Honourable, by the Courtesy of England.

To the Sons of Viscounts and Barons are given the Titles of Esquires and Honourable; and that of Honourable likewise to their Daughters, but without any other Addition.

Every Gentleman, in any Place of Honour or Trust, is styled Honourable; but no Commoners (those of his Majesty's Privy-Council, the Lord Mayors of London, York, and Dublin, and the Lord Provost of Edinburg, for the Time being, excepted) are styled Right Honourable.

Lastly, every considerable Servant to his Majesty, the Prince of Wales, or any other of the Royal Family, whilst on the Civil or Military List, distinguished by the Title of Esquire.

To the Parliament.

To the Right Hon. the Lords Spiritual and Temporal, in Parliament of Great Britain, assembled. *My Lords; May it please your Lordships.*

To the Hon. the Knights, Citizens, and Burgeses, in Parliament of Great Britain, assembled. *Gentlemen; May it please your Honours.*

To the Right Honourable Sir H. B. Speaker of the Honourable House of Commons. *Sir; or if he be a Lord, My Lord; or May it please your Lordship.*

N. B. He is for the most Part a Member of the Privy-Council.

To the Clergy.

To the most Reverend Father in God A. Lord Archbishop of C. or Y. *My Lord, your Grace.*

To

To the Right Reverend Father in God, O. Lord Bishop of L. *Right Reverend Sir.*

To the Rev. Mr. or Dr. (according to their Station) *A. Z.* Dean of *B.* Chancellor of *C.* Archdeacon of *D.* Prebendary of *E.* Rector of *F.* Vicar of *G.* Curate of *H.* The general Term to these is, *Sir*; but to a *Dean* or *Archdeacon* we say, *Mr. Dean*, and *Mr. Archdeacon*.

All Rectors, Vicars, Curates, and Clergymen of other inferior Denominations, are styled *Reverend*.

To the Officers of his Majesty's Household.

To these we address for the most part according to their Quality, but sometimes according to their Office; as, *My Lord Steward, My Lord Chamberlain, &c.*

To the Commissioners, &c. on the Civil List.

To the Right Hon. *A.* Earl of *B.* Lord Privy Seal—Lord President of the Council—Lord Great Chamberlain—Earl Marshal of *England*—One of his Majesty's Principal Secretaries of State, &c. *My Lord*; or *May it please your Lordship*.

To the Right Hon. the Lords Commissioners of the Treasury—of the Admiralty, &c. *The same.*

To the Hon. the Commissioners of his Majesty's Customs—Revenue of Excise, &c. *May it please your Honours.*

To the Soldiery.

To the Right Hon. *A.* Earl of *B.* Capt. of his Majesty's First Troop of Horse Guards—Band of Gentlemen Pensioners, &c. To *A. B.* Esq; Lieutenant General—Surveyor General of the Ordnance, &c. *Your Honours.*

To the Officers of the Navy.

To his Grace *A.* Duke of *B.* Lord High Admiral of Great Britain. *Your Grace.*

To Vice-Admirals, Rear-Admirals, and Captains. *Sir*; or, *Your Honour*; except they be Noblemen.

To the Ambassadors.

To his Excellency, *Sir A. B.* Bart. Envoy Extraordinary from his *Britannic* Majesty to—Ambassador to—his Resident at, &c. *Your Excellency.*

To Secretaries and Consuls. *Sir.*

To the Judges and Lawyers.

To the Right Hon. *A.* Baron of *B.* Lord High Chancellor,—Master of the Rolls—Lord Chief Justice of the King's Bench—Common Pleas. *My Lord*; *your Lordship*; and to such as are only *Honourable*,—*Sir*; *may it please*

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Of ARITHMETIC. 81

please you, Sir : And the same to all other Graduates in the Law.

N. B. Every Barrister is styled *Esquire*.

Note, All such Gentlemen as are in the Commission of Peace, are also styled *Esquires*, and address'd to as *Worshipful*; as are also Sheriffs and Recorders.

The Aldermen and Recorder of the City of London, and all Mayors of Corporations, (the Lord Mayor only excepted) have the Title of *Right Worshipful*.

Governors of Hospitals, Colleges, &c. are styled *Right Worshipful*, or only *Worshipful*, according as their respective Titles may be.

Bodies Corporate are stiled *Honourable*, and sometimes *Worshipful*.

A *Baronet* and a *Knight* are for the most Part stiled *Honourable*, and their Wives have the Title of *Ladies*.

As to the Address made to *Merchants*, and other Persons in Trade, it is only, *Sir*.



Of ARITHMETIC.

ARITHMETIC is the Science of Numbers. A NUMBER is compounded of several *Units*. An *Unit* is any Kind of Thing whose Parts we do not consider, or what Part it is of any Thing else. Thus a *Shilling* is an Unit; and *twelve Pence* are likewise Units: But while a Penny is called the twelfth Part of a Shilling, it is only the twelfth Part of an Unit.

Figures are made Use of to express all possible Numbers; which are as follow. 1, *One*. 2, *Two*. 3, *Three*. 4, *Four*. 5, *Five*. 6, *Six*. 7, *Seven*. 8, *Eight*. 9, *Nine*. 0, *Cypher*. These Figures are often called *Digets*.

The 0 *Cypher*, properly speaking signifies *Nothing*; and yet it communicates to the other Figures, which precede it, ten Times the Value they had before; insomuch, that being placed after one, 1, the Value will be ten Times as much. Thus, 10 makes *Ten*; 20, *Twenty*; 30, *Thirty*; 40, *Forty*; 50, *Fifty*; 60, *Sixty*; 70, *Seventy*; 80, *Eighty*; 90, *Ninety*. Again, another *Cypher* added to 10 makes it ten Times more; and this, as often as it is repeated, Thus.

82 Of ARITHMETIC.

Thus 100, is a *Hundred*; 1000, a *Thousand*; 10000, Ten *Thousand*; 100000, a *Hundred Thousand*, &c.

Thus we may perceive, that, when several Figures follow each other in a Row, the first Figure on the Right Hand signifies only *Units*; the second, proceeding from the Right to the Left, denotes as many *Tens* as there are *Units*; the third, as many *Hundreds* as there are *Units*; and so on, according to this Progression, as the following Table will shew.

Units,	Thousands,	Millions,
Tens,	Tens of Thousands,	Tens of Millions,
Hundreds,	Hundred of Thousands,	Hundreds of Millions,

This Determination of the Value of Figures is called **NUMERATION**. Therefore, suppose we want to know the Value of the following Number, 872365422, it will be proper to divide them into *Threes* by Commas, in the following Manner, beginning at the three first on the Right Hand, and proceeding to the Left; as, 872,365,422. But it will be plainer thus:

Hundreds of Millions.	Hundreds of Thousands.	Eight Hundred
Tens of Millions.	Tens of Thousands.	Seventy-
Millions.	Thousands.	Two Millions,
	Hundreds.	Three Hundred
	Tens.	Sixty-
	Units.	Five Thousand,
		Four Hundred
		Twenty-
		Two.

8 7 2, 3 6 5, 4 2 2, 8 7 2, 3 6 5, 4 2 2.

When the Number is very large, the Numeration is carried much higher, and from *Millions* they proceed to *Billions*, *Trillions*, *Quartillions*, *Quinquillions*, *Sextillions*, *Septillions*, *Octillions*, &c. And then it will be proper to put a *Point* over a *Thousand*, 1 over a *Million*, 2 over a *Billion*, &c. That is, from a *Million* every sixth Figure must be numbered with 1, 2, 3, 4, 5, 6, 7, 8, &c. which will greatly ease the Memory; though, to say the Truth, there is very seldom any Occasion for such a long Succession of Figures. Suppose the following Sum was to be numbered.

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3 4 0 7 6 3 8	2 9 6 4 0 9 7 8	

Which is, *Three hundred and forty Billions, Seven hundred and sixty-three thousand eight hundred and twenty-nine Millions, Six hundred and forty Thousand, Nine hundred and Seventy-eight.*



Of WHOLE NUMBERS.

UNDER this Head we shall comprehend the principal Rules of Arithmetic, namely, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION; for by the Means of these all other Operations are performed. I shall therefore begin first with

ADDITION of Whole Numbers.

SIMPLE Addition teaches the Manher of adding several Things together of the same Kind, and to find out a Sum which is equal to them all. To this End we must place the proposed Numbers one under another, *Units* under *Units*, *Tens* under *Tens*, *Hundreds* under *Hundreds*, and so on. If there be any void Space on the Left Hand, it is of no Consequence. Under these you must draw Line, as in the following Example.

24326
4235
12035
6342
2304
625

49867

You must begin the Addition towards the Right Hand in the Column of Units, saying, 5 and 4 make 9, and 2 make 11, and 5 make 16, and 5 make 21, and 6 make

84 OF ARITHMETIC.

27; that is two Tens and seven Units. Therefore you must only write 7 under the Column of Units, and carry 2. Then proceed to the next Column, and say, 2 that carry and 2 is 4, and 4 is 8, and 3 is 11, and 3 is 14, and 2 is 16; for the 0 signifies Nothing, and may be neglected: Therefore put down 6, and carry 1. Then say, 1 and 6 is 7, and 3 is 10, and 3 is 13, and 2 is 15, and 3 is 18: Therefore set down 8, and carry 1 for the Ten. Then say, 1 and 2 is 3, and 6 is 9, and 2 is 11, and 4 is 15, and 4 is 19: Set down 9, and carry 1. Then say, 1 and 1 is 2, and 2 is 4. Which set down, and the Work is done.

To prove that these Numbers are put rightly together, the best Way will be to add them together again, beginning at the Top, and proceeding downwards. After which, if both the Sums are the same, you may reasonably conclude it to be rightly done; for it is not probable the same Mistake should be committed both Ways.

When a Bill or Account is very long, it will be proper to make a Point at every Ten, that there may be no Mistake in the Sum Total; thus:

2734
3945.
6542
5763
9278.
1712

29974

8759
3268

12027

Other EXAMPLES.

3876	6583	5943
5943	7856	7689
8354	9875	3214
18173	3481	6798
	27795	5467
		29111

A TABLE of ADDITION for Exercise.

1	2	3	4	7
2	3	5	6	11
3	4	7	8	15
4	5	9	10	19
5	6	11	12	23
6	7	13	14	27
7	8	15	16	31
8	9	17	18	35
9	10	19	20	39
10	11	21	22	43

It may be read thus: 1 and 2 is 3, and 4 is 7; 2 and 3 is 5, and 6 is 11; and so on.

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SUBTRACTION of *Whole Numbers.*

Substraction teaches the Manner of taking a Number from another that is greater of the same Kind. To this End having written the lesser of the two Numbers under the greater; that is, Units under Units, Tens under Tens, Hundreds under Hundreds, &c. draw a Line under them, and take each Figure that is set below from the other that is above, beginning at the Right Hand, and proceeding to the Left, and put what remains under the Line; when nothing remains you must put 0. This being done, it is plain that the last Number placed under the Line will be the Difference or *Remainder* that is required. Suppose 3254 *l.* were to be subtracted from 4876 *l.* Place them thus:

$$\begin{array}{r} 4876 \\ 3254 \\ \hline 1622 \end{array}$$

Begin with Units on the Right Hand, and say, 4 from 6 and there remains 2, which must be placed under the 4; then 5 from 7 and there remains 2, which set under the 5; 2 from 8 and there remains 6, which write under the 2; 3 from 4 and there remains 1, which place under the 3. The Proof of Substraction is by adding the lesser Number to the Remainder, and if the Sum is equal to the greater the Operation is rightly performed. Thus, 3254 being added to 1622, makes 4876:

$$\begin{array}{r} 3254 \\ 1622 \\ \hline 4876 \end{array}$$

This Operation shews that there is no Difficulty in Substraction, when the top Figure is greater than that which stands below. But it is not quite so easy when those above are less than those below. In this Case you must borrow from the next Figure towards the Left Hand, which you must add to the Figure that is too little, insomuch that this

86 Of ARITHMETIC.

Figure being increased by the Number below, may be taken from it. An Example will make all plain.

8546

2768

5778

Say 8 from 6 I cannot take, but 8 from 10 and 6, that is 16, and there remains 8. Then proceed to the next Figure, and say, 1 that I borrowed and 6 is 7; but 7 from 4 I cannot take, therefore I must borrow another 10; then 7 from 14 and there remains 7. Again, 1 that I borrowed and 7 is 8; 8 from 5 I cannot take, but 8 from 15 and there remains 7. 1 that I borrowed and 2 is 3, and 3 from 8 and there remains 5.

To prove the Truth of this Operation, add the lesser Number and the Remainder together, and if the Sum is equal to the greater Number the Operation is right. Thus,

2768

5778

8546

When there are several Sums to be taken from one single Sum, the best Way will be to add those that are to be subtracted together, and then take the Sum from the other Number. Thus, 1543, 2304, 1648, are to be subtracted from 6542; I therefore add the lesser Numbers together.

1543

2304

1648

5495

Then 5495 being subtracted from 6542, there will remain 1047.

6542

5495

1047

Again

Of ARITHMETIC. 87

Again, when one Sum is to be substracted from several Sums, you must add the Sums together, and then make a Substraction. Thus,

$$\begin{array}{r} 4325 \\ 4212 \\ 3876 \\ 3957 \\ \hline \end{array}$$

$$\underline{16370}$$

Which done, you may substract your other Number from the Sum. Thus,

$$\begin{array}{r} 16370 \\ 14326 \\ \hline \end{array}$$

Remains, $\underline{2044}$



MULTIPLICATION of Whole Numbers.

Multiplication of whole Numbers teaches to multiply two proposed Numbers together which are of the same Kind, and are properly called *absolute Numbers*, to obtain their *Product*. When this is obtained by the Multiplication of two equal Numbers, as 4 and 4, it is called a *Square Number*. When this is again multiplied by 4 it will produce a *Cubic Number*. Thus 4 times 4 is 16, the *Square Number*. This multiplied again by 4, produces the *Cubic Number* 64.

That Number by which the other is multiplied is called the *Multiplier*. That Number which is multiplied is called the *Multiplicand*. Either of the Numbers may be used for the one or the other. However, it is customary to make the lesser Number the *Multiplier*, and the greater the *Multiplicand*. These are sometimes called *Factors*.

In order to multiply large Numbers it will be necessary to get the following Tables by Heart.

2	$\begin{Bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 2 \\ 4 \\ 6 \\ 8 \\ 10 \\ 12 \\ 14 \\ 16 \\ 18 \end{Bmatrix}$	3	$\begin{Bmatrix} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 9 \\ 12 \\ 15 \\ 18 \\ 21 \\ 24 \\ 27 \end{Bmatrix}$	4	$\begin{Bmatrix} 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{Bmatrix}$	is	$\begin{Bmatrix} 16 \\ 20 \\ 24 \\ 28 \\ 32 \\ 36 \end{Bmatrix}$

38 Of ARITHMETIC.

$$\begin{array}{l}
 5 \left\{ \begin{array}{l} 5 \\ 6 \\ 7 \\ 8 \\ 9 \end{array} \right\} \text{ is } \left\{ \begin{array}{l} 25 \\ 30 \\ 35 \\ 40 \\ 45 \end{array} \right\} \\
 6 \left\{ \begin{array}{l} 6 \\ 7 \\ 8 \\ 9 \end{array} \right\} \text{ is } \left\{ \begin{array}{l} 36 \\ 42 \\ 48 \\ 54 \end{array} \right\} \\
 7 \left\{ \begin{array}{l} 7 \\ 8 \\ 9 \end{array} \right\} \text{ is } \left\{ \begin{array}{l} 49 \\ 56 \\ 63 \end{array} \right\} \\
 8 \left\{ \begin{array}{l} 8 \\ 9 \end{array} \right\} \text{ is } \left\{ \begin{array}{l} 64 \\ 72 \end{array} \right\} \\
 9 - 9 \text{ is } 81
 \end{array}$$

$$\begin{array}{l}
 10 \left\{ \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \end{array} \right\} \text{ is } \left\{ \begin{array}{l} 10 \\ 20 \\ 30 \\ 40 \\ 50 \\ 60 \\ 70 \\ 80 \\ 90 \\ 100 \end{array} \right\} \\
 12 \left\{ \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \end{array} \right\} \text{ is } \left\{ \begin{array}{l} 12 \\ 24 \\ 36 \\ 48 \\ 60 \\ 72 \\ 84 \\ 96 \\ 108 \\ 120 \\ 132 \\ 144 \end{array} \right\}
 \end{array}$$

The following Table exhibits the Whole at one View.

The MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

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Of ARITHMETIC. 89

The Use of this Table is easy, for if you look in the Head for the Figure to be multiplied, and in the side Column towards the Left-hand for the Multiplier, you will find the Product in the Angle of Meeting. Thus 6 in the Head and 7 in the Side, carrying your Eye straight along from each, will give 42 in the Angle of Meeting.

In order to multiply one Sum by another, place the *Multiplier* under the *Multiplicand*, in the following Manner.

$$\begin{array}{r}
 3456 \\
 365 \\
 \hline
 17280 \\
 20736 \\
 10368 \\
 \hline
 1261440
 \end{array}$$

You must begin with the first Figure of the Multiplier on the Right, and say within yourself, 5 times 6 is 30 and put down 0, as you see in the Example, and carry 3; then say, 5 times 5 is 25 and 3 that I carry is 28, put down 8 and carry 2; then 5 times 3 is 15 and 2 that I carry is 17, which must be put down, because the Multiplication of that is at an End.

Then pass on to the second Figure of the Multiplier, which is Tens, and say, 6 times 6 is 36, set down 6 under the 8, which is the Place of Tens, and carry 3; 6 times 5 is 30 and 3 that I carried is 33, put down 3 and carry 3; 6 times 4 is 24 and 3 that I carried is 27, put down 7 and carry 2; 6 times 3 is 18 and 2 that I carry is 20, which must be all put down.

Then go to the last Figure 3, which is Hundreds, and say 3 times 6 is 18, set down 8 under the 3 in the Place of Hundreds and carry 1; 3 times 5 is 15, and 1 that I carry is 16, put down 6 and carry 1; 3 times 4 is 12 and 1 that I carry is 13, put down 3 and carry 1; 3 times 3 is 9 and 1 that I carried is 10, which must be put down, and then the Multiplication is ended. This done, add the Products together, as you see in the Example.

Take Notice, that a Cypher in Multiplication produces nothing, and therefore when there are any in the Multiplier they must be neglected. Only observe to set the 0 that was to be multiplied in its proper Place, otherwise it will

90 Of ARITHMETIC.

cause a great Error. For Instance, suppose I want to know the Contents of a Piece of Land, which is of an oblong Square, whose Length is of 324 Poles, and Breadth 208. It may be known by multiplying the Length into the Breadth, in the following Manner.

$$\begin{array}{r}
 324 \text{ Length.} \\
 208 \text{ Breadth.} \\
 \hline
 2592 \\
 6480 \\
 \hline
 67392 \text{ The Content.}
 \end{array}$$

Having first multiplied 324 by 8, you must put down 6, under the 9, over against the 0 in the Multiplier. Afterwards you must multiply 324 by 2, and the two Products being added together you will have 67392 square Poles for the Content.

When there is one or more Cyphers at the Beginning of a Sum on the Right-hand, they may be neglected in the Multiplication and added afterwards: As for Example, suppose 700 was to be multiplied by 70, multiply 7 by 7 which makes 49, then add the three 000 and the Sum will be 49,000. Thus 200 times 200 make 40,000; 300 times 2000 make 600,000, &c.

Sometimes the common Method of Multiplication may be inconvenient, requiring more Room towards the Left-Hand, than can be spared on some particular Occasions, then you may put the first Figure of the Multiplier towards the Left, under the first Figure of the Multiplicand towards the Right; thus,

$$\begin{array}{r}
 94698 \\
 39 \\
 \hline
 284094 \\
 852282 \\
 \hline
 3693222
 \end{array}$$

When you would multiply any Number by 11, place them thus; 456 and add them together.

$$\begin{array}{r}
 456 \\
 \hline
 5016
 \end{array}
 \qquad
 \begin{array}{r}
 897654 \\
 897654 \\
 \hline
 9874194
 \end{array}$$

When

OF ARITHMETIC. 95

When you would multiply any Number by 12, first put the same Number underneath, and then repeat it one remove to the Left-hand; thus,

12	24	36	852
12	24	36	852
12	24	36	852
144	288	432	10224

There is another very remarkable Way of Multiplication, when the Multiplier is composed of two smaller Numbers multiplied into each; for then you may multiply the Multiplicand by one of these Numbers, and the Product by the other, and the second Number will be the Product sought. Thus 3 times 4 makes 12; and 2 times 6 makes 12. If you are therefore desirous of knowing how many Pence is 346 Shillings, you may multiply them by either of these Numbers.

346	346	346
3	2	346
1038	692	346
4	6	4152
4152 Pence	4152 Pence	

The last is done by the former Method, which is inserted to shew their Agreement.

Suppose 3426 was to be multiplied by 56 in this Way, it will be produced by multiplying 7 and 8 together. I shall therefore perform the Operation in the common Way and in this Method, that the Agreement may more evidently appear.

3426	3426
56	7
20556	23982
17130	8
191856	191856

This Rule is of great Use in the Multiplication of mix'd Numbers, as will hereafter appear.

92 OF ARITHMETIC.

DIVISION of Whole Numbers.

Division of Whole Numbers teaches the Manner of dividing one absolute Number by another that is smaller, to know how many times the smaller Number is contained in the greater. The former is called the *Divisor* and the latter the *Dividend*; and the *Quotient* is the Number of Times the Divisor is contained in the Dividend. When there is any thing left after the Division, it is called the *Remainder*.

There are various methods of performing *Division*, which I shall leave to them that have more Room, being determined to put nothing in this Treatise but what is necessary and useful. Therefore I shall only treat of one Method of Division, which is most commonly practised, and is, indeed, the most convenient of all others.

First of all, suppose 20736 was to be divided By 6, the Figures must be placed thus,

	<i>Dividend</i>	
<i>Divisor</i> 6)	20736	(<i>3456 Quotient</i>
	18	6
	27	<i>20736 Proof</i>
	24	
	33	
	30	
	36	
	36	
	0	

This Operation must be begun on the Left Hand; and therefore I ask, How many times 6 is to be had in 2? The Answer is, Not once. Then I demand again, How many times 6 in 20? The Answer is, 3. Now three times 6 is 18, which must be placed under 20, and subtracted from it. The Remainder will be 2; to which I bring down the next Figure 7, as in the Example. Then how many times 6 in 27? Four. Four times 6 is 24; 24 from 27, and there remains 3. Then bring down 3. How many times 6 in 33? Five. Five times 6 is 30; take it from 33, and there remains 3. Then bring down

Of ARITHMETIC. 93

How many times 6 in 36? Six. Six times 6 is 36; which being taken from 36, nothing remains.

Suppose it was required to divide 73241 by 28. Place the Figures as in the foregoing Question.

$$28 \overline{) 73241} (2615$$

$$56 \dots$$

$$172$$

$$168$$

$$44$$

$$28$$

$$161$$

$$140$$

21 Remainder.

Then say, How many times, or how often is 2 in 7? Three times. But before you set down the 3 in the Quotient, consider what will remain, which is but 1; for 3 times 2 is 6, and 6 from 7 and there remains 1. Now this 1 being in a Place higher than the 3 that follows, it stands in the Place of Tens with respect to that 3; and the 1 and 3 so placed make 13. Therefore you must try if you can make 3 times 8, which is 24, out of 13: Which it is plain you cannot; and therefore take the next Figure less, which is 2. Place 2 in the Quotient, and then say, twice 8 is 16. Set down 6 under 3, and carry 1. Twice 2 is 4, and 1 that I carry is 5, which place under the 7. Then say, 6 from 3 I cannot, but 6 from 13 and there remains 7; which must be set down under 6, as you see in the Example. One that I borrowed and 5 is 6, and 6 from 7 and there remains 1; which set under the 5. This done, bring down the third Figure 2, and place it on the Right of 17, which remained after the first Substraction. Then begin again, and say, How many times 28 in 172? and you will find it to be six times. Place 6 in the Quotient, and proceed as before, saying, 6 times 8 is 48; set down 8, and carry 4. Then 6 times 2 is 12, and 4 that I carried is 16; which must be set down to the Left of the 8. Then say, 8 from 2 I cannot, but 8 from 12 and there remains 4. Then 1 that I borrowed and 6 is 7; 7 from 7, and there

re-

94 Of ARITHMETIC.

remains nothing. This done, bring down the next Figure 4, and ask how many times 28 can be had in 44, which is but once. 8 from 14 and there remains 6, that I carry and two is 3; 3 from 4 and there remains 1. Bring down the last Figure, which is 1; and then ask how many times 28 in 161, which is 5 times. Then say, 5 times 8 is 40; set down 0, and carry 4; then 5 times 2 is 10, and 4 that I carried is 14, which set down to the Left of the 0. Then say, 0 from 1, and there remains 1; 4 from 6, and there remains 2. Set down 2 and 1, which makes the Remainder 21.

Some, especially in large and difficult Sums, make a small Table of the Divisor multiplied into the nine Digits, by which means they can readily tell how many Times the Divisor is contained in any Number. Suppose the Divisor to be 28, as before, and then the Table will stand thus:

1	28
2	56
3	84
4	112
5	140
6	168
7	196
8	224
9	252

Which may be read thus; once 28 is 28, twice 28 is 56, thrice 28 is 84, 4 times 28 is 112, 5 times 28 is 140, 6 times 28 is 168, 7 times 28 is 196, 8 times 28 is 224, and 9 times 28 is 252.

As the Proof of Division is Multiplication, so the Proof of Multiplication is Division; I forbore to speak of it before the Reader could be supposed to know any Thing of Division; I therefore now give an Example to set this Matter in an evident Light. Suppose 684 was to be multiplied by 72, the Work will stand thus,

$$\begin{array}{r}
 684 \text{ Multiplicand} \\
 72 \text{ Multiplier} \\
 \hline
 1368 \\
 4788 \\
 \hline
 49248 \text{ Product}
 \end{array}$$

Of ARITHMETIC. 95

To prove that the Multiplication is rightly performed, make the Product the Dividend, and the Multiplier the Divisor. Thus

72)49248(684 Quotient

432

604

576

288

288

0

So that 684 being equal to the Multiplicand, it plainly appears that the Multiplication was rightly performed.

EXAMPLES of Division for Practice.

234)54756(234

468..

795

702

936

939

0

637)587951(923

5733..

1465

1274

1911

1911

0

861)1739852(2020

1722...

1785

1722

Remaind. 632

COMPOUND ADDITION, or ADDITION of Numbers of several Denominations.

Compound Addition teaches to add several Things together of different Kinds or Denominations: and therefore it will be necessary, first of all to shew, how many Units of the smallest Kind are contained in the next greater, which will appear plainly from the following TABLES.

TA-

96 OF ARITHMETIC.

TABLES of MONEY, WEIGHT, MEASURE, and TIME.

MONEY.

4 Farthings	}	make one	Penny
12 Pence			Shilling
20 Shillings			Pound
21 Shillings			Guinea
27 Shillings			Moidore
72 Shillings or			Port
3 Pound 12	}		Half Port
36 Shillings			

AVERDUPPOIS WEIGHT.

16 Drams	}	make one	Ounce
16 Ounces			Pound
14 Pounds			Stone
2 Stone			Quarter
28 Pounds			Quarter
56 Pounds			Half Hundred
84 Pounds	}		Three Quarters
112 Pounds			Hundred
20 Hundred	}		Ton

TROY WEIGHT.

24 Grains	}	make one	Penny Weight
20 Penny Weights			Ounce
12 Ounces			Pound

APOTHECARIES WEIGHT.

20 Grains, gr.	}	make one	Scruple, 3
3 Scruples, 3			Dram, 3
8 Drams, 3			Ounce, 3
12 Ounces, 3			Pound, 16

WOOL WEIGHT.

7 Pounds	}	make one	Clove
2 Cloves			Stone
2 Stones			Todd
6½ Tods			Wey
2 Weys			Sack
12 Sacks			Last

CLOTH

Of ARITHMETIC.

97

CLOTH MEASURE.

4 Nails	}	make one	Quarter
4 Quarters			Yard
5 Quarters			Ell <i>English</i>
3 Quarters			Ell <i>Flemish</i>

LONG MEASURE.

3 Barley Corns	}	make one	Inch
12 Inches			Foot
3 Feet			Yard
45 Inches			Ell
2 Yards			Fathom
5½ Yards			Pole or Perch
40 Perches			Furlong
8 Furlongs			Mile

SQUARE or SUPERFICIAL MEASURE.

16 Quarters of an Inch	}	make one	Inch
144 Inches			Foot
9 Feet			Yard
30¼ Yards			Pole
40 Poles long and 1 broad			Rood
4 Square Roods			Acre
640 Acres			Square Mile

DRY MEASURE.

2 Pints	}	make one	Quart
2 Quarts			Pottle
8 Pints			Gallon
2 Gallons			Peck
4 Pecks			Busshel
4 Busshels			Coom
2 Cooms			Quarter of a Chaldron Corn
5 Quarters			Wey
2 Weys			Last
36 Busshels			Chaldron Coal Measure

WINE MEASURE.

2 Pints	}	make one	Quart
2 Quarts			Pottle
4 Quarts			Gallon
63 Gallons			Hogshead
2 Hogsheads			Pipe
2 Pipes			Tun

K

BEER

BEER and ALE MEASURE.

2 Pints	}	make one	Quart
4 Quarts			Gallon
8 Gallons			Firkin of Ale
9 Gallons			Firkin of Beer
2 Firkins			Kilderkin
2 Kilderkins			Barrel
3 Barrels			Hogheads

T I M E.

60 Seconds	}	make one	Minute
60 Minutes			Hour
24 Hours			Day
7 Days			Week
4 Weeks			Month
365 Days, 5 Hours, and 49 Minutes, wanting 3 Seconds			Tropical Year

M O T I O N.

60" Seconds	}	make one	Minute
60' Minutes			Degree
30° Degrees			Sign
90° Degrees			Quadrant
360° Degrees			Great Circle of the Sphere

Though the preceding Tables are of great Use, both for their Plainness and Accuracy, yet it will be proper to give the following, which are more particular than the former, and exhibit the whole Contents of the different Denominations in the several Species.

MEASURE of LENGTH.

Barley Corns.		Inch.		Palm.		Span.		Foot.		Cubit.		Yard.		Pace.		Fathom.		Pole.		Furlong.		Mile.	
3		3		3		3		1 1/3		1 1/2		2		1 2/3		1 1/3		2 1/2		132		8	
9		9		9		9		4		2		3		2		2		4		110		16	
27		27		27		27		12		6		4		6		4		12		336		48	
36		36		36		36		16		8		6		8		6		16		440		64	
54		54		54		54		24		12		9		12		8		24		660		96	
108		108		108		108		48		24		18		24		16		48		1320		192	
180		180		180		180		72		36		27		36		24		72		2640		384	
216		216		216		216		96		48		36		48		32		96		3360		480	
594		594		594		594		288		144		108		144		112		288		10560		1536	
23760		23760		23760		23760		11520		5760		4320		5760		4480		11520		42240		6144	
190080		190080		190080		190080		46080		23040		17280		23040		18112		46080		337920		49152	

SQUAR

Of ARITHMETIC. 99

S Q U A R E M E A S U R E.

Inches Square.									
144		Feet Sq.							
1296		9		Yards Sq.					
3600		25		277		Paces Sq.			
39204		272.25		30.25		10.89		Poles Sq.	
1568160		10390		1210		435.6		40 Rood Sq.	
6272640		43560		4840		1742.4		160 4 Acres Sq.	
3097600		1115136		10240		12590		640 Miles.	

WINE MEASURE, with the SOLID INCHES
contained therein.

Solid Inch.									
28.875	Pint.								
231	8	Gallon.							
4158	144	18	Rundlet.						
7276.6	252	31.5	1.75	Barrel.					
9702	336	42	2.333	1.333	Tierce.				
14553	504	63	3.5	2	1.5	Hoghead.			
19279	672	84	4.66	2.66	2	1.333	Butt.		
29106	1008	126	7	4	3	2	1.5	Tun.	
258212	2016	252	14	8	6	4	3	2	Bar.

N. B. Instead of the Parts of whole Numbers, called Fractions, the decimal Parts are expressed, which will be explained hereafter. I shall only observe at present, that when Fractions are turned into Decimals they are much more easily managed, both in Multiplication and Division; as also in all other Parts of Arithmetick.

ALE MEASURE. BEER MEASURE.

Pints.				Pints.			
8	Gallon.			8	Gallon.		
64	8	Firkin.		9	72	Firkin.	
128	16	2	Kilderkin.	2	18	144	Kilderkin.
256	32	4	2 Barrel.	2	4	36	288 Barrel.
512	64	8	4 2 Hhgs.	2	4	8	72 576 Hhds.

Ka

DRY

100 Of ARITHMETIC.

DRY or CORN MEASURE, with the
SOLID INCHES contained therein.

Solid Inch.			
33.6	Pint.		
268.8	8	Gallon.	
537.6	16	2	Peck.
2150.4	64	8	4 Bushel.
17203.2	512	64	32 8 Quarter.

These Things being premised, write all the proposed Sums one under the other, in such a Manner that the same Kinds may be in the same Column. The Example following, which is an Addition of Pounds, Shillings and Pence, in which you must begin at the first Column on the Right-Hand, which consists of Pence, and after having found how many Shillings are contained therein, you must write the Surplus at the Bottom of the same Column, keeping in Mind the Number of Shillings it contains, to add them to the Column of Units under Shillings. Then cast up the Shillings together, and see how many Pounds they contain, writing the Surplus at the Bottom. Then carry the Number of Pounds to the Column of Pounds, and add them together as before taught.

Examples of MONEY.

l.	s.	d.	l.	s.	d.	l.	s.	d.	grs
34	10	8	11	11	11	39	16	11	$\frac{1}{2}$
92	1	4	10	16	8	64	16	8	$\frac{1}{4}$
48	19	7	47	13	10	49	10	10	
102	14	5	65	11	11	32	11	5	$\frac{1}{2}$
72	11	2	41	17	7	62	17	7	$\frac{1}{4}$
63	13	8	96	15	5	29	13	4	
414	10	10	274	7	4	279	6	11	$\frac{1}{2}$

In the first Example, because the Sum of the Pence is 34, which contains two Shillings and ten Pence, I write 10 under their Column, and carry the two Shillings to the next Column, which makes 70 Shillings; therefore I set down 10 under the Shillings, and carry 3 to the Pounds, because 60 Shillings, which remain when 10 are taken away, make three Pounds; the rest must be completed as taught in the Addition of whole Numbers.

To compute the Pence more readily, it will be proper to get the following Tables by heart.

OF ARITHMETIC. 101

	d.		s.	d.
1	12	20	1	8
2	24	30	2	6
3	36	40	3	4
4	48	50	4	2
5	60	60	5	0
6	72	70	5	10
7	84	80	6	8
8	96	90	7	6
9	108	100	8	4
10	120	110	9	2
11	132	120	10	0
12	144			

AVERDUPOIS WEIGHT.

The Columns are distinguished by these Marks at the Top:
T. Tuns, C. Hundreds, q. Quarters, lb. Pounds, oz. Ounces,
dr. Drams.

T.	C.	q.	lb.	oz.	dr.
64	19	2	11	12	10
35	14	3	10	13	15
62	11	1	12	10	12
21	13	2	14	8	9
29	17	3	12	4	6
214	17	1	6	2	4

Note, For every 16 Drams carry 1 Ounce; for every 16 Ounces one Pound; for every 28 Pounds 1 Quarter; for every four Quarters, one Hundred; and for every 20 Hundred, one Ton.

TROY WEIGHT.

lb.	oz.	dw.	gr.	lb.	oz.	dw.	gr.
3	10	14	12	41	10	17	10
2	8	10	19	31	11	14	11
1	3	13	11	10	10	15	15
0	11	14	18	11	11	11	10
2	9	19	21	10	10	17	16
11	8	13	9	107	7	16	14

Note, for every 24 Grains carry one Penny-Weight, for every 20 Penny-Weights one Ounce, and for 12 Ounces one Pound.

102 OF ARITHMETIC

APOTHECARIES WEIGHT.

lb.	3.	3.	3.	gr.
8	11	7	2	18
6	7	4	1	0
0	3	6	2	19
3	10	5	1	10
4	8	3	1	11
24	6	4	0	18

lb.	3.	3.	3.	gr.
3	8	2	1	11
2	7	3	1	12
0	10	7	1	12
3	7	5	2	14
2	6	61		16
13	5	2	0	5

Note, for every 20 Grains, carry 1 Scruple; for every 3 Scruples 1 Dram, for every 8 Drams 1 Ounce, and for every 12 Ounces 1 Pound.

CLOTH MEASURE.

Yds	qrs	ns.	Yds	qrs	ns.	Ells	qrs	ns.
62	3	2	42	2	3	27	4	3
45	1	3	26	3	2	73	3	1
36	2	1	63	1	2	36	2	2
73	1	2	34	2	1	65	1	1
218	1	0	167	2	0	203	1	3

Note, for every 4 Nails, carry a Quarter, for every 4 Quarters a Yard, and for every 5 Quarters an Ell.

WINE MEASURE.

Tns	pipes	hgs	gall.	qrs.	pts.	Tns	pipes	hgs	gall.	qrs.	pts.
35	1	1	62	3	1	23	1	0	10	2	1
54	0	1	24	2	0	34	0	1	12	3	0
42	0	0	43	2	1	54	1	1	60	1	1
26	1	0	31	1	1	41	1	0	13	0	1
159	0	0	36	1	1	154	0	1	33	2	3

Note, for 2 Pints, carry 1 Quart, for 4 Quarts a Gallon, for 63 Gallons 1 Hoghead, for 2 Hogheads one Pipe, for two Pipes 1 Ton.

BEER MEASURE.

Hgs.	bar.	kild.	fir.	gal.	pts.	Butts.	bar.	kild.	fir.	gal.	pts.
46	1	1	0	8	7	34	2	1	0	7	3
63	0	1	1	6	2	45	1	0	1	8	2
35	0	0	1	4	3	52	2	1	0	6	1
52	1	1	1	5	5	72	0	0	1	1	2
4198	0	1	1	7	1	125	1	0	0	6	0

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OF ARITHMETIC. 103

Note, *In the first Sum*, for every eight Pints carry 1 Gallon, for every 9 Gallons 1 Firkin, for every 2 Firkins 1 Kilderkin, for every 2 Kilderkins 1 Barrel, and for every 2 Barrels 1 Hoghead. *In the second Sum*, for every 4 Quarts carry 1 Gallon, for every 9 Gallons 1 Firkin, for every 2 Firkins 1 Kilderkin, for every 2 Kilderkins 1 Barrel, and for every 3 Barrels 1 Butt; but it is seldom necessary to set down so many particulars. Pints or Quarts, Gallons and Hogheads being generally sufficient, of which I shall give Examples in

ALE MEASURE.

Hgs. galls. qrs.	Hgs. galls. pts.	Hgs. galls. qrs.
78 63 3	37 51 7	27 71 3
83 10 2	75 10 3	71 10 2
36 12 1	56 14 6	13 12 2
62 20 0	63 62 5	63 11 1

260 42 2

233 11 5

175 34 0

Note, the last Sum is Beer Measure, and you must carry 1 Hoghead for every 72 Gallons; whereas in Ale Measure you must carry a Hoghead for every 64 Gallons.

DRY MEASURE.

Qrs. bush. gals. pts.	Qrs. bush. gals. pts.
64 7 6 3	53 6 5 3
42 1 3 6	36 5 4 2
21 5 4 5	61 7 1 5
16 2 7 4	15 2 6 7

145 1 6 2

167 0 2 1

Note, for every 8 Pints carry 1 Gallon, for every 8 Gallons 1 Bushel, for every 8 Bushels 1 Quarter.

N. B. *Long Measure* and *Time* cannot be properly added together, on Account of the Fractions which intervene, and therefore we must defer Examples of that till we come to treat of *Decimals*.



SUBTRACTION of several Denominations.

IN this Operation, you must observe how many of the first make one of the second, and so on. And if the Figure or Figures are greater than those you are to subtract from, then borrow one from the next Denomination, set

104 Of ARITHMETIC.

set down the Remainder underneath, and carry 1 to the next Figure; as for Example. £. s. d.

Received, 275 11 3
Laid out, 196 12 5

78 18 10

Take 5 from 3 I cannot, but 5 from a Shilling or 12d. which added to 3 make 15d. and there remains 10, set down 10 underneath, and then proceed to the next. One that I borrowed and 12 is 13, but 13 from 11 I cannot, therefore borrow 20s. which make 31s. now 13 from 31, and there remains 18, which set down and proceed to the next Column. Then I say, 1 that I borrowed and 6 makes 7, but 7 from 5 I cannot, therefore 7 from 15 and there remains 8, one that I borrowed and 9 is 10, 10 from 7 I cannot, but 10 from 17 and there remains 7, 1 that I borrowed, and 1 is 2, 2 from 2 and there remains 0.

To prove whether this Operation is rightly performed or not, add the Remainder to the Sum subtracted, and if it makes the same Sum you subtracted from, then it is right.

Thus 196 12 5
Added to 78 18 10

Makes 275 11 3

AVERDUPUIS WEIGHT.

Tns. C. qrs lb. oz. dr.
From 3 12 2 11 11 10
Subtract 2 19 3 14 13 12

Remains 0 12 2 24 13 14

Proof 3 12 2 11 11 10

TROY WEIGHT.

lb. oz. dwt. gr.
From 24 10 17 11
Subtract 17 11 19 17

6 10 17 18

Proof 24 10 17 11

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OF ARITHMETIC. 105

CLOTH MEASURE.

	Ells.	qrs.	ns.			Yards.	qrs.	ns.
Bought	47	16	2 1		Bought	37	12 3 2	
Sold	100	13	97 4 3		Sold	19	13 2 1	
Remains	36	24	8 12 2 2		Remains	17	99 1 1	
Proof	47	16	2 1		Proof	37	12 3 2	



MULTIPLICATION of divers Denominations.

MULTIPLICATION of divers Denominations teaches the Manner of multiplying a Sum consisting of several Species by a Whole Number. In this Case you must begin at the Right Hand, and multiply the lowest Denomination by the Multiplier, observing how often the next greatest Denomination is contained in the Product, which Number must be carried to the next Denomination, and the Remainder must be set down.

Suppose 70*l.* 12*s.* 8*d.* was to be multiplied by 7; set them down thus,

$$\begin{array}{r}
 \text{£.} \quad \text{s.} \quad \text{d.} \\
 70 \quad 12 \quad 8 \\
 \hline
 7
 \end{array}$$

$$\begin{array}{r}
 494 \quad 8 \quad 8
 \end{array}$$

Then say, 7 times 8 is 56, which Number being Pence contains 4*s.* 8*d.* set down 8 under the Pence, and carry the 4 to the Shillings; then say, 7 times 12 is 84, and 4 that I carried is 88, which is 4 Pounds 8 Shillings, carry 4 to the Pounds, and set down 8 under the Shillings; afterwards say 7 times 0 is 0 and 4 that I carry is 4, which must be set down in the Place of the Pounds; then 7 times 7 is 49, which must be set down as in common Multiplication.

EXAMPLES for Practice

What will 5 Ells of Holland cost at 7*s.* 9*d.* $\frac{1}{2}$ per Ell?

Answer, 1*l.* 18*s.* 11*d.* $\frac{1}{2}$.

What will 9 Yards of Broad Cloth cost at 15*s.* 8*d.* per Yard?

Answer, 7*l.* 1*s.*

What will 12 Galls. of Rum come to at 8*s.* 6*d.* per Gall.?

Answer, 5*l.* 2*s.*

What does 3 Dozen of Stockings come to at 2*l.* 3*s.* 6*d.* a Dozen?

Answer, 6*l.* 10*s.* 6*d.*

When

106 OF ARITHMETIC

When there is Occasion to multiply several Denominations by a larger Multiplier than a single Digit, observe if the two Figures can be produced by any other two multiplied together. And if so, multiply the Sum by one of those two Figures, and the Product by the other. Thus 56 is composed of 8 and 7. Therefore I say,

If one Piece of Muslin cost 4*l.* 1*s.* 4*d.* what will 56 cost!

<i>l.</i>	<i>s.</i>	<i>d.</i>
4	14	4
		8
37	14	8
		7
264	2	8

If a Piece of Flanders Lace cost 7*l.* 18*s.* 9*d.* what will 72 Pieces cost?

Now as 72 is composed of 9 and 8, I proceed as before; thus,

<i>l.</i>	<i>s.</i>	<i>d.</i>
7	18	9
		9
71	8	9
		8
571	10	0

When two Numbers cannot be found that make up the Multiplier exactly, take the nearest, and add the Multiplicand as many Times as the remaining Diget comes to. Suppose 1*l.* 4*s.* 2*d.* was to be multiplied by 19, 6 times 3 is 18, and 1 makes 19; therefore the Multiplicand is to be added once.

<i>l.</i>	<i>s.</i>	<i>d.</i>
1	4	2
		6
7	5	0
		3
21	15	0
		2
22	19	2

Again

OF ARITHMETIC. 107

Again, suppose you were to multiply 57 Yards, 2 Feet, 7 Inches by 59. This Multiplier 59 cannot be produced by the Multiplication of any two Digits together, therefore take 56, which is 7 times 8. And take 56 from 59 and there remains 3; with these Numbers proceed as in the following Examples.

Yds	Ft	In.
57	2	7
462	2	8
		7
3240	0	8

This done, multiply 57 2 7 by the Remainder, thus,

173	1	9
3240	0	8
3413	0	5

add this Product to the Second.

which makes the Sum desired.

EXAMPLES for Practice.

What will 21 Firkins cost at 13s. 4d. $\frac{1}{2}$ per Firkin?

Ans. 14l. 0s. 10d. $\frac{1}{2}$

What will 18 Yards of Silk cost at 8s. 7d. $\frac{1}{4}$ per Yard?

Ans. 7l. 14s. 10d. $\frac{1}{2}$

What will 64 C. wt. of Butter cost at 3l. 19s. 8d. $\frac{1}{2}$ per C.?

Ans. 255l. 1s. 4d.

What will 72 Casks of Soap cost at 1l. 3s. 9d. per Cask?

Ans. 81l. 2s. 6d.

If 9 Yards cost 11l. 8s. 2d. what will 63 cost?

In this Case, ask how many times 9 is in 63, which is 7, multiply 11l. 8s. 2d. by 7, and the Answer will be 79l. 17s. 2d.

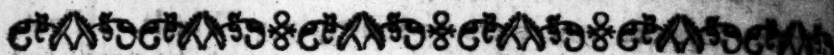
If 3 Tons cost 91l. 18s. 2d. what will 24 cost?

Ans. 735l. 5s. 4d.

What will 19 Barrels cost at 1l. 4s. 2d. per Barrel?

Ans. 22l. 19s. 2d.

108 Of ARITHMETIC



DIVISION of divers Denominations.

IN this Sort of Division what remains of the Pounds must be reduced into Shillings, which must be divided as before, and what remains of the Shillings bring into Pence, and divide them together, with what is found in the Place of Pence, as in the following Example. Suppose 7580*l.* 13*s.* 4*d.* was to be divided between 747 Men,

$$\begin{array}{r} \text{Men } \text{£.} \quad \text{s.} \quad \text{d.} \\ 747 \overline{) 7580} \quad 13 \quad 4(10\text{.} \\ 747 \cdot \end{array}$$

110

20

2200

13

747)2213(2*s.*

1494

719

12

1438

719

8628

4

747)8632(11*d.*

747

1162

747

415

4

747)1660(2¹/₇ Farthings.

1494

166

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When the Numbers are placed as above, ask how many times 747 in 758? which is 1, place 1 in the Quotient, and bring down 0, how many times 747 in 110? the Answer is 0, set that down in the Quotient likewise; then multiply 110 by 20, to bring it into Shillings, which will produce 2200 Shillings; to which add the 13 Shillings in the Dividend, and the Sum will be 2213; then ask how many times 747 in 2213 which is 2, and 719 will remain; multiply 719 by 12 to bring it into Pence, and the Product will be 8628, to which add 4 in the Dividend, and the Sum will be 8632; divide this as before, then reduce the Remainder into Farthings, and the Answer will be,

10*l.* 2*s.* 11*d.* $\frac{1}{2}$ $\frac{166}{747}$.

Suppose 3824*l.* 12*s.* 4*d.* was to be divided among 8 Men: then it is 478*l.* 1*s.* 6*d.* $\frac{1}{2}$ a Man.

If 8 Dozen of Hose cost 13*l.* 14*s.* 8*d.* what is one Dozen worth? *Ans.* 1*l.* 14*s.* 4*d.*

If the Cloathing a Regiment of 740 Men cost 3000*l.* how much is that for each Man? *Ans.* 4*l.* 1*s.* 0*d.* $\frac{3}{4}$ $\frac{3}{7}$.



OF FRACTIONS.

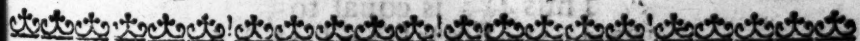
A Rithmetical Fractions are one or more Parts of an Integer, or whole Number, which may be divided into like Parts. Thus there may be $\frac{1}{2}$ one half, $\frac{1}{3}$ one third, $\frac{1}{4}$ of a Shilling, Pound, Yard, &c.

Every Fraction is expressed by two Terms, the first or uppermost of which is called the *Numerator*, and the second or undermost the *Denominator*; Thus

5 Numerator.

6 Denominator.

If the first Term is less than the second, the Fraction is less than a whole Number, as $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$. When the first Term is greater than the second, then its Value is more than an Integer. This is called an *improper Fraction*.



REDUCTION of FRACTIONS.

To reduce a FRACTION to its least Terms.

W HEN the Numerator and Denominator of a Fraction are expressed in large Numbers they may be often reduced to lower Terms, retaining the same Value. This

BOOK OF ARITHMETIC.

This is done by dividing separately both the Terms by the same Divisor, which must be the greatest Number we can find for that Purpose. Thus the Fraction $\frac{9}{12}$ may be reduced to $\frac{3}{4}$, by dividing the 9 by 3, which gives 3 in the Quotient, and by dividing 12 by the same Divisor, you will have 4 in the Quotient. Thus $\frac{3}{4}$ are the least Terms of $\frac{9}{12}$.

But to find the greatest Divisor of the two Terms of a given Fraction, in order to reduce it to its least Terms, you must divide the second Term by the first, without having any Regard to the Quotient. Then you must continue to divide the Divisor by the Remainder of each Division, till there remains nothing, and then the last Divisor may be taken for the greater common Measure. The following Example will make this Matter plain.

Let the Fraction be $\frac{304}{768}$.

$$\begin{array}{r} 304 \overline{) 768} (2 \\ \underline{608} \end{array}$$

$$\begin{array}{r} \text{Remainder } 160 \overline{) 304} (1 \\ \underline{160} \end{array}$$

$$\begin{array}{r} 144 \overline{) 160} (1 \\ \underline{144} \end{array}$$

$$\begin{array}{r} 16 \overline{) 144} (9 \\ \underline{144} \end{array}$$

000

Thus the greatest common Measure is 16, which makes the Fraction $\frac{16}{48}$. But if there remains one after all these Divisions, the Fraction is not to be reduced, and therefore must remain as it is.

Fractions may be shortened when their Terms are even, by continually halving them, or dividing them by 2.

Thus $\frac{192}{224}$ is equal to $\frac{6}{7}$

$$\frac{192}{224} \mid \frac{96}{112} \mid \frac{48}{56} \mid \frac{24}{28} \mid \frac{12}{14} \mid \frac{6}{7}$$

To reduce FRACTIONS of different Denominations to the same Denomination.

We often meet with Fractions that arise from the same subjects, or several subjects of the same Kind, as $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$ of a Pound, Yard, Shilling, &c. Now to reduce these different Fractions, and all others, we must find a common

OF ARITHMETIC. 111

common Denominator; which is done by multiplying all the Denominators continually among themselves, 2 times 3 is 6, 4 times 6 is 24, 6 times 24 is 144, and 8 times 144 is 1152, for a common Denominator of all the Fractions given. Then multiply every Numerator into all Denominators except its own, and by that Means you will gain so many Numerators which will stand thus,

$$\frac{2}{3} \quad \frac{3}{4} \quad \frac{4}{6} \quad \frac{5}{8} \quad \frac{7}{8} \\ \frac{576}{1152} \quad \frac{768}{1152} \quad \frac{864}{1152} \quad \frac{960}{1152} \quad \frac{1008}{1152} = \frac{4176}{1152}$$

Sometimes there are *Compound Fractions* which it will be necessary to reduce to a simple Fraction, as $\frac{1}{4}$ of $\frac{2}{3}$ of $\frac{1}{2}$ of a Pound. Multiply the Numerators together, and the Product will be 2 for a new Numerator. Then multiply the Denominators together, and the Product will be 40 for a new Denominator; then set them down thus $\frac{2}{40}$ or $\frac{1}{20}$, when halved. Now the twentieth Part of a Pound is a Shilling, which is the true Value of the above Fractions. To prove this multiply a Pound or 20 Shillings by the Numerator, and the Product will be 20. Divide this by the Denominator, and the Quotient will be 1, that is one Shilling.

To reduce Integers or whole Numbers, into Improper Fractions.

When there is no Denominator assigned, you need only put 1 under it and it is done; 10 makes $\frac{10}{1}$; 6 $\frac{6}{1}$, 100 $\frac{100}{1}$, &c. But when there is a Denominator assigned, as suppose 8, multiply it into the whole Number, and you will have a new Numerator. If the whole Number was 10; multiply 10 by 8 and you will have the Numerator 80, then the Fraction will be $\frac{80}{8}$. When there is a Fraction joined to a whole Number, multiply the whole Number by the Denominator of the Fraction and the Product will be the Numerator, when the Numerator of the Fraction is added thereto. Thus if 5 and $\frac{3}{4}$ is to be reduced. Multiply 5 by 4 the Denominator of the Fraction, and the Product will be 20, to which add 3 the Numerator of the Fraction; and the Sum 23 is the new Numerator, thus $\frac{23}{4}$.

To reduce FRACTIONS into Integers and Parts of Integers.

This Rule is the Reverse of the Former: for you need only divide the Numerator of the given Fraction by its Denominator, and you will have the Integers in the Quotient, and the Remainder, if any, will be the Fraction of the Integer. For Instance, divide 103 by the Denominator 4, and there will be 25 in the Quotient; and the Remainder 3 will be $\frac{3}{4}$ of one of the same Integers. A D-

112 Of ARITHMETIC.

ADDITION and SUBTRACTION Of FRACTIONS.

ADDITION and Subtraction of Fractions, supposes them all to be of the same kind, as $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$. In this Case, you have nothing to do but to add the Numerators together, for a new Numerator, keeping the same Denominator. Thus 1 and 3 make 4, and 5 is 9, and 7 make 16 for the Numerator. And then the Fraction will be $\frac{16}{8}$. But if they are of several Denominations, they must be reduced to one as before taught; for Example, $\frac{4}{5}$ and $\frac{6}{8}$ make $\frac{62}{40}$. This Rule is so easy, it cannot be mistaken when the Reduction of Fractions is well learn'd.

The SUBTRACTION of one Fraction from another supposes the same Conditions as in *Addition*. Thus the Fractions being of one Denomination, you have nothing to do but subtract the Numerator of the less from the Numerator of the greater, and the Operation is over. Thus if you take $\frac{3}{8}$ from $\frac{5}{8}$, there will remain $\frac{2}{8}$. When they are of different Denominations, you must reduce them to one Denomination and proceed as above. Thus if it were required to take $\frac{3}{5}$ from $\frac{5}{8}$; when reduced to one Denomination they will stand thus $\frac{74}{72}$, $\frac{48}{72}$ therefore subtract 24 from 45 and there will remain $\frac{21}{72}$.

When Fractions of Fractions are to be subtracted they must be reduced into a single Fraction, and then subtracted as before. Example, $\frac{1}{2}$ of $\frac{2}{3}$ are to be subtracted from $\frac{3}{4}$ of $\frac{4}{5}$. The first two reduced to a single Fraction is $\frac{1}{3}$, which halved is $\frac{1}{6}$; the second two will be $\frac{12}{16}$ equal to $\frac{3}{4}$, or $\frac{3}{4}$. Then reduce $\frac{1}{6}$ and $\frac{3}{4}$ to one Denomination and they will produce $\frac{1}{12}$ and $\frac{9}{12}$, and the first being subtracted from the second, the Remainder will be $\frac{8}{12}$.



MULTIPLICATION of FRACTIONS.

IN the Multiplication of Fractions the Operation cannot be performed, without reducing mixt Numbers to improper Fractions, and compound Fractions, to single ones. Likewise if one of the Fractions is a whole Number, it must be reduced to an improper Fraction. Then multiply the Numerators together for a new Numerator, and the Denominator for a new Denominator. Thus $\frac{4}{5}$ multiplied

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Of ARITHMETIC. 113

multiplied by $\frac{3}{4}$ make $\frac{12}{16}$ or $\frac{6}{8}$ or $\frac{3}{4}$. Likewise $\frac{2}{3}$ multiplied by $\frac{3}{4}$ make $\frac{6}{12}$ or $\frac{1}{2}$, which is less than either of the Fractions that were to be multiplied together. This may seem strange to some, and therefore it will be necessary to acquaint them, that though whole Numbers multiplied by whole Numbers increase the Product, so proper Fractions multiplied by proper Fractions always lessen it; for as 1 multiplied by 1, makes 1. So that which is less than 1, being multiplied by that which is less than 1, must needs make less than 1; as $\frac{1}{2}$ and $\frac{1}{2}$ multiplied together make only $\frac{1}{4}$.

Fractions of Fractions are to be multiplied together, they must be first reduced to single Fractions. *Example,* Multiply $\frac{3}{5}$ of $\frac{5}{6}$ by $\frac{1}{2}$ of $\frac{2}{3}$. Then $\frac{3}{5}$ of $\frac{5}{6}$ will make $\frac{15}{30}$ or $\frac{1}{2}$, and $\frac{1}{2}$ of $\frac{2}{3}$ will make $\frac{2}{6}$ or $\frac{1}{3}$. This done multiply $\frac{1}{2}$ and $\frac{1}{3}$ together, and the Product is $\frac{1}{6}$.

When you intend to multiply a whole Number and a Fraction together; multiply the whole Number by the Numerator, and divide the Product by the Denominator: As for Example, multiply 4 by $\frac{3}{4}$; 3 times 4 is 12, which divided by 4 make 3, a whole Number. Or which is the same Thing, multiply $\frac{4}{1}$ by $\frac{3}{4}$, and the Product will be $\frac{12}{4}$ equal to 3, because the Numerator contains the Denominator 3 times.

If you would multiply a whole Number and a Fraction by a whole Number and a Fraction, reduce them into improper Fractions, and work as before. Thus 3 $\frac{1}{4}$ make $\frac{13}{4}$, and 2 $\frac{1}{3}$ make $\frac{7}{3}$. These multiplied together make $\frac{91}{12}$ or 7 and $\frac{7}{12}$.



DIVISION of FRACTIONS.

IN this, as in all others, Compound Fractions must be reduced to simple, mixt Numbers to improper Fractions, and then the Denominator of the Divisor must be multiplied into the Numerator of the Dividend, for the Numerator of the Quotient; and the Numerator of the Divisor must be multiplied into the Denominator of the Dividend for the Denominator of the Quotient. Suppose $\frac{3}{4}$ was to be divided by $\frac{7}{8}$. Set them down thus.

$$\frac{7}{8} \frac{3}{4} (\frac{21}{32}) \text{ Quotient.}$$

$$\text{Likewise, } \frac{1}{2} (\frac{1}{4}) (\frac{2}{8})$$

L 3

Here

114 Of ARITHMETIC.

Here you may perceive that the Quotient is greater than the Dividend, for the like Reason as in Multiplication.

To divide a whole Number by a Fraction, reduce it into an improper Fraction. Suppose 20 was to be divided by $\frac{3}{4}$. Set them down thus, $\frac{3}{4})\frac{20}{1}(\frac{80}{3}$ that is $26\frac{2}{3}$.

Again, if 5 and $\frac{1}{2}$ were to be divided by 3 and $\frac{1}{4}$ they will stand thus $\frac{13}{4})\frac{5\frac{1}{2}}{2}(\frac{44}{6}$ that is $1\frac{18}{6}$ or $\frac{9}{3}$.

If $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ is to be divided by $\frac{2}{3}$ of $\frac{1}{2}$, reduce them into simple Fractions, and they will stand thus,

$$\frac{2}{3})\frac{6}{24}(\frac{48}{36} \text{ equal to } 1\frac{12}{36} \text{ or } \frac{6}{18} \text{ or } \frac{3}{9} \text{ or } \frac{1}{3}.$$



Of DECIMAL FRACTIONS.

WHEN Integers or whole Numbers are divided or supposed to be divided into 10, 100, 1000, or 10,000, &c. equal Parts; then these are the Denominators of each Fraction, which might be written down under the Numerator, but are now entirely omitted: Thus the Decimal Fraction 25, has 100 for its Denominator, and might be written $\frac{25}{100}$. In like Manner, 125 may be written $\frac{125}{1000}$ and 3575 $\frac{3575}{10000}$, 00065 $\frac{00065}{100000}$; but the Denominators, as observed before, are quite left out.

And here the first Doubt that will probably arise is, why 000 are placed before 65, because they are unnecessary to be placed in common Arithmetic; wherefore we must observe, that as Cyphers put to the Right-hand of whole Numbers, increase those Numbers in a decuple or ten-fold Proportion, so being placed on the same Side of Decimals, they are of no Signification at all, unless a Digit is placed further to the Right-hand: Thus $\frac{2500}{100000}$ is equivalent to $\frac{25}{1000}$, or .25. But Cyphers placed before a Decimal Fraction diminish its Value in a tenfold Proportion; for .25, if you prefix a Cypher before it, becomes $\frac{25}{1000}$, or .025; and .65, by prefixing 00 before it, becomes $\frac{65}{10000}$ or .0065, &c. But this Increase or Decrease of Value will best appear from the following Table.

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9	Hundreds of Millions.	6	Hundreds of Thousands.
8	Tens of Millions.	5	Tens of Thousands.
7	Millions.	4	Thousands.
6	Hundreds of Thousands.	3	Hundreds.
5	Tens of Thousands.	2	Tens.
4	Thousands.	1	Units.
3	Hundreds.	2	Tens.
2	Tens.	3	Hundreds.
1	Units.	4	Thousands.
2	Tens.	5	Tens of Thousands.
3	Hundreds.	6	Hundreds of Thousands.
4	Thousands.	7	Millions.
5	Tens of Thousands.	8	Tens of Millions.
6	Hundreds of Thousands.	9	Hundreds of Millions.
7	Millions.		
8	Tens of Millions.		
9	Hundreds of Millions.		

Hence it appears, why, in writing a Decimal Fraction, whose Denominator has more Cyphers than there are Figures in the Numerator, they must be supplied by fixing so many Cyphers before the Figures of your Numerator; for Instance, suppose $\frac{19}{1000}$ were to be written down without the Denominator, then, because there are three Cyphers in the Denominator, and but two Figures in the Numerator, you must therefore prefix a Cypher before the 19, and set it down thus, .019.

Integers are separated from the Decimals by a Dot or Point; and if there are no whole Numbers, then a Dot before the Fraction is sufficient: Thus if you were to write down $317\frac{245}{1000}$, it must be thus expressed, 317.245 and $87\frac{0036}{10000}$ thus, 87.0036, &c.



REDUCTION of DECIMALS.

THE Reduction of Decimals contains three Cases:

1. To reduce a Vulgar Fraction to a Decimal.
2. To find the Value of a Decimal in Coin, Weight, Measure, &c.
3. To reduce Coin, Weight, and Measure to a Decimal.

To reduce a Vulgar Fraction to a Decimal, you must add a competent Number of Cyphers to the Numerator, and then divide the Sum by the Denominator; the Quotient will be a Decimal equivalent to the Fraction. Example, let $\frac{1}{2}$ be reduced to a Decimal; add a Cypher to the 1 and divide it by 2, and the Quotient will be 5. If $\frac{3}{4}$ is the Fraction, add a Cypher to 3 and it will make 30, which divide by 4, the Quotient will be 7, and 2 will remain

116 Of ARITHMETIC.

main; add 0 to that, and it will make 20, which divided by 4, quotes 5, and nothing will remain, which shews the Work is done, and that the Decimal is .75.

But observe, that in most Cases there will be a Remainder, as in the following Example of reducing $\frac{3}{573}$ to a Decimal; add six Cyphers to the Numerator, and divide by the Denominator, and the Quotient will be 5235; but as six Cyphers were added, it must consist of six Places by placing Cyphers before it thus .005235, for the Number of the Quotient must be always equal to the Cyphers added to the Numerator. See the Work.

573)3000000(535 Quotient.

2865...

1350

1146

2040

1719

3210

2865

345 Remainder.

The Remainder you see is 345, which is less than the $\frac{1}{1000000}$ of an Unit, and therefore may be safely rejected.

To find the Value of a Decimal in Money, Weights, or Measures, you multiply the given Decimal by the Number of Parts in the next inferior Denomination, and from the Product prick off as many Places as there are Figures in the given Decimal, and multiply the Figures pricked off by the Number of Parts in the next inferior Denomination, and prick off as many Places as before, and so on. An Example will make it plain.

Let .7565 of a Pound Sterling be reduced to Shillings, Pence, and Farthings. Now the next inferior Denomination is Shillings, of which twenty are contained in a Pound. Multiply the Decimal by twenty, and prick off four Places towards the Right-Hand; then multiply the Figures pricked off by 12, the Number of Pence in a Shilling; prick off four Places again, and multiply them by 4, the Number of Farthings in a Penny. See the Work.

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OF ARITHMETIC. 117

$$\begin{array}{r}
 .7565 \\
 20 \\
 \hline
 15.1300 \text{ Shillings.} \\
 12 \\
 \hline
 2600 \\
 1300 \\
 \hline
 1.5600 \\
 4 \\
 \hline
 2.2400 \text{ Farthings.}
 \end{array}$$

So that the Product is $15s. 1d. \frac{1}{2}$

In the Fraction of a Pound Sterling there is a readier Way to find the Value of a Decimal; for the first Figure next the Dot, when doubled, produces Shillings, and if the next Figure is less than 5, the Remainder is Farthings, remembering to abate 1 when they are more than 13, and when more than 38. But if the second Figure is more than 5, take 1 from it, for which add 1 Shilling to the Shillings before found. The Remainder of the second Figure, when 5 is taken away, must be prefixed to the third Figure, and reckon them as Farthings, and if they are above 13, abate 1. If above 38, abate 2, as before. Thus,

The Value of .2 of a Pound is 4s.

The Value of .5 of a Pound is 10s

The Value of .25 of a Pound is 5s.

The Value of .45 of a Pound is 9s.

The Value of .75 of a Pound is 15s.

The Value of .412 of a Pound is 8s 3d.

The Value of .519 of a Pound is 10s. 4d. $\frac{1}{2}$.

For double 5 and it makes 10s. and take 1 from 19 and the Remainder will be 18 Farthings, which make 4d. $\frac{1}{2}$

The Value of .561 of a Pound is 11s. 2d. $\frac{3}{4}$

The Value of .785 of a Pound is 15s. 8d. $\frac{1}{2}$

The Value of .895 of a Pound is 17s. 10d. $\frac{1}{4}$

To reduce the Parts of Money, Weight, Measure, &c. to a Decimal

Suppose you want to know the Decimals of Shillings, Pence and Farthings as Parts of a Pound; you must then enquire how many Shillings, Pence or Farthings are contained in a Pound. Thus there are 20 Shillings, 240 Pence, or 960 Farthings in a Pound. Therefore add 2 Cyphers

118 Of ARITHMETIC

to the Number of the Parts you would have turned into a Decimal, and divide by the Number of the like Parts contained in a Pound. Let 17s. be the Example.

$$20 \overline{) 1700} (.85 \text{ the Decimal sought.}$$

$$\begin{array}{r} 160. \\ \hline 100 \\ 100 \\ \hline \end{array}$$

...
This being only Shillings, I divide by 20, the Shillings in a Pound, after 2 Cyphers have been added to 17, and the Quotient .85 is the Decimal sought.

If there had been Shillings and Pence, for Instance, 7s. and 9d. to be reduced to the Decimal of a Pound; then first reduce them to Pence thus; and proceed accordingly.

$$\begin{array}{r} s. \quad d. \\ 7 : 9 \\ \hline 12 \\ 14 \\ 7 \\ \hline 84 \\ 9 \end{array}$$

$$240 \overline{) 93.000} (.3875$$

$$\begin{array}{r} 720. \\ \hline 2100 \\ 1920 \\ \hline 1800 \\ 1680 \\ \hline 1200 \\ 1200 \\ \hline \end{array}$$

...
Let 6d. be reduced to a Decimal of a Pound; add Cyphers to 6, and divide by 240.

$$240 \overline{) 6000} (.025$$

$$\begin{array}{r} 480 \\ \hline 1200 \\ 1200 \\ \hline \end{array}$$

...

Again
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pound.

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Ag

Of ARITHMETIC. 119

Again in $3d. \frac{3}{4}$ there are 15 Farthings; therefore to 15 annex six Cyphers, and divide by 960, the Farthings in a Pound.

960)15 000000(.015625

$$\begin{array}{r}
 960 \\
 \hline
 5400 \\
 4800 \\
 \hline
 6000 \\
 5760 \\
 \hline
 2400 \\
 1920 \\
 \hline
 4800 \\
 4800 \\
 \hline
 \end{array}$$

...

In the same Manner you may proceed with Weights, Measures, &c. Only remember to reduce them to the least Quantity mentioned, and proceed as before. Thus if a Yard is the Integer, and Inches the least Parts mentioned, the Whole must be reduced to Inches, and divided by 36 the Number of Inches in a Yard.

To reduce a Decimal by the known Parts of its Integer.

Multiply the Decimal given by the known Parts of the inferior Denomination; still multiplying the remaining Decimals by the known Parts of the next inferior Denomination, till you have brought it to the least known Parts of the Integer. The Figures standing on the Left of the separating Points, will be the Parts required.

How many Shillings, Pence, and Farthings, are in .7691 Parts of a Pound?

$$\begin{array}{r}
 .7691 \\
 20 \text{ Shillings} \\
 \hline
 15.3820 \\
 12 \text{ Pence} \\
 \hline
 4.5840 \\
 4 \text{ Farthings} \\
 \hline
 2.3364
 \end{array}$$

Answer, 15s. 4d. $\frac{3}{4}$

A Dr.

120 Of ARITHMETIC.

A Decimal TABLE of ENGLISH COIN.

A Pound the Integer.		Shilling the Integer.	
S.	Decimals.	D.	Decimals.
19	.95	11	.045833
18	.9	10	.041666
17	.85	9	.0375
16	.8	8	.033333
15	.75	7	.029166
14	.7	6	.025
13	.65	5	.020833
12	.6	4	.016666
11	.55	3	.0125
10	.5	2	.008333
9	.45	1	.004166
8	.4		
7	.35		
6	.3	Farth.	
5	.25	3	.003125
4	.2	2	.002083
3	.15	1	.001042
2	.1		
1	.05		

By the Help of the above Table it may be performed thus,

.7691 next lowest Decimal being 15s.

.75

.0191 Remainder

.0166 next lowest, 4d.

.0025 Remainder

.0010 next lowest, 2g.

.0015

Decimal

Of ARITHMETIC. 121

Decimal Tables of *Troy* and *Avoirdupois* Weights.

TROY WEIGHT. A Pound the Integer.		AVOIRDUPOIS Weight. 112 Pounds the Integer.	
Ounces.	Decimals.	Quarters.	Decimals.
11	.916666	3	.75
10	.833333	2	.6
9	.75	1	.25
8	.666666		
7	.583333		
6	.5		
5	.416666		
4	.333333		
3	.25		
2	.166666		
1	.083333		
This Table of Ounces, will likewise serve for Inches.			
Penny- wts.	Decimals.	Pounds.	Decimals.
10	.041666	20	.178971
9	.0375	10	.089286
8	.033333	9	.080357
7	.029166	8	.071428
6	.025	7	.0625
5	.020833	6	.053971
4	.016666	5	.044643
3	.0125	4	.035714
2	.008333	3	.026786
1	.004166	2	.017857
		1	.008928
		Ounces.	Decimals.
		10	.005580
		9	.005022
		8	.004464
		7	.003906
		6	.003348
		5	.002790
		4	.002232
		3	.001673
		2	.001116
		1	.000553
Grains.	Decimals.	Drams.	Decimals.
20	.003472	10	.000348
10	.001736	9	.000313
9	.001562	8	.000279
8	.001389	7	.000244
7	.001215	6	.000209
6	.001042	5	.000174
5	.000868	4	.000139
4	.000694	3	.000104
3	.000521	2	.000069
2	.000347	1	.000034
1	.000173	$\frac{1}{2}$	.000017
$\frac{1}{2}$	.000086		

M

Decimal

Decimal Tables of *Time* and *Cloth Measure*.

T I M E. One Year the Integer.		T I M E. One Day the Integer.	
Day.	Decimals.	Hours.	Decimals.
300	.821918	20	.833333
200	.547945	10	.416666
100	.276373	9	.375
90	.246575	8	.333333
80	.219178	7	.291666
70	.191781	6	.25
60	.164383	5	.208333
50	.136986	4	.166666
40	.109589	3	.125
30	.082192	2	.083333
20	.054794	1	.041666
10	.027397		
9	.024657	Mins.	Decimals.
8	.021918	50	.034722
7	.019178	40	.027777
6	.016438	30	.020833
5	.013699	20	.013888
4	.010059	10	.006944
3	.008219	9	.00625
2	.005479	8	.005555
1	.002739	7	.004861
		6	.004166
		5	.003472
		4	.002777
		3	.002083
		2	.001388
		1	.000694

CLOTH MEASURE.
A Yard the Integer.

Quarters.	Decimals.
3	.75
2	.5
1	.25
Nails.	Decimals.
3	.1875
2	.125
1	.0625

Decimals

* *
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Of ARITHMETIC. 123

Decimal Tables of *Liquid* and *Dry Measure*.

LIQUID. A Gallon the Integer.		DRY.
Pints.	Decimals.	Bush.
7	.875	7
6	.75	6
5	.625	5
4	.5	4
3	.375	3
2	.255	2
1	.125	1

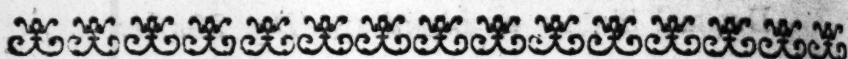
Galls.	Decimals.	Pecks.
3	.09375	3
2	.0625	2
1	.03125	1

Decimals.	qrs. Pecks.
.023437	3
.015625	2
.007812	1

Decimals.	Pints.
.004859	3
.003906	2
.001953	1

*** The Use of the foregoing Tables is very plain ; one Column in each Table contains the Shillings, Ounces, Bushels, &c. and against the said Number in the other Column, the Decimal Parts answering thereto. Thus against 9 Shillings in the first Table you will find .45. Against 9 Ounces in the second Table .75.

If the exact Number is not found in the Tables, you must add the Numbers together, of which it is compounded. Thus if the Decimal Parts of 15 Grains are sought in the second Table ; the Decimal 10 Grains is .001736, and 5 is .000868, the Sum will be 00204, the Decimal sought.



ADDITION *and* SUBTRACTION *of* DECIMALS.

PLACE the Dots or Points at the Beginning of the Fractions over each other, and add them together as if they were whole Numbers.

E X A M P L E S.

<u>.244</u>	<u>.756</u>	<u>3.568</u>	<u>56.373</u>
.682	.678	8.834	834.763
<u>.926</u>	<u>1.434</u>	<u>12.402</u>	<u>891.136</u>

Let the Number of the Figures be never so unequal, the same Rule must be observed, as in the following Examples.

<u>1.24</u>	<u>68.7</u>
65.96	93.98
329.658	48.07
<u>6638.1</u>	<u>82.099</u>
<u>7034.958</u>	<u>292.849</u>

In SUBTRACTION the Numbers must be placed in the same Manner as in Addition, and then proved as in whole Numbers.

E X A M P L E S.

<u>198.73</u>	<u>265.12</u>	<u>200.7</u>
136.21	139.56	96.95
<u>62.52</u>	<u>125.56</u>	<u>103.75</u>



MULTIPLICATION *of* DECIMALS.

THE only Difference between Multiplication of Decimals, and common Multiplication, consists in knowing the Value of the Product; and in this there is little or no Difficulty, for you are only to cut off by a Dot, so many Figures from the Product as there are Decimals in both Factors, or in the Multiplier and Multiplicand. As for Example, let 236.85 be multiplied by 4.5 thus.

236.85

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$$\begin{array}{r}
 236.85 \\
 4.5 \\
 \hline
 118425 \\
 94540 \\
 \hline
 1063.825
 \end{array}$$

Now because there are two Decimals in the Multiplcand, and one in the Multiplier, you must prick off three in the Product. It often happens that the Product does not contain so many Decimals as there are Decimals in the Multiplier and Multiplcand, in which Case there must be as many Cyphers prefixed on the Left-hand as will make up the Number.

EXAMPLES.

$\begin{array}{r} .2 \\ \hline \end{array}$	$\begin{array}{r} .3 \\ \hline \end{array}$	$\begin{array}{r} .0125 \\ \hline \end{array}$	$\begin{array}{r} .001472 \\ \hline \end{array}$
$\begin{array}{r} .2 \\ \hline \end{array}$	$\begin{array}{r} .2 \\ \hline \end{array}$	$\begin{array}{r} .03 \\ \hline \end{array}$	$\begin{array}{r} .1045 \\ \hline \end{array}$
$\begin{array}{r} .04 \\ \hline \end{array}$	$\begin{array}{r} .06 \\ \hline \end{array}$	$\begin{array}{r} .000375 \\ \hline \end{array}$	$\begin{array}{r} 7360 \\ 5888 \\ 14720 \\ \hline \end{array}$
			$\begin{array}{r} .0001538240 \\ \hline \end{array}$

But as there is no Necessity of setting down all the Figures in the Product, a Method has been invented to contract this Kind of Multiplication, which is as follows: You are first to determine how many Decimals you will have in the Product, which in general may be four; but may be three, two, or one: Then write the Unit's Place of the Multiplier under the Figure of the Multiplcand, whose Place you intend to keep in the Product; then write all the other Figures of the Multiplier the contrary Way, or invert their Order, and always begin with the Figure in the Multiplcand, which stands over that you are multiplying withal, and set down the first Figure of each particular Product directly under each other, at the same Time regarding the Figure preceding that in the Multiplcand, that is, what you are to carry from it after multiplying. The following Examples will make the Matter plain: Suppose one Decimal only was required in the Product from 23.7 and 4.6; being multiplied the common Way they will stand thus,

126 Of ARITHMETIC.

$$\begin{array}{r} 23.7 \\ 4.6 \\ \hline 1422 \\ 948 \\ \hline \end{array}$$

109.02

The contracted Way thus, $\begin{array}{r} 23.7 \\ 6.4 \\ \hline 948 \\ 1422 \\ \hline \end{array}$

109.02

When the Number is inverted, as you see, begin with the 4, which will produce the same Product as in the common Way. Then multiply the Figure that stands directly over 6 by 6, which makes 18. Then proceed to the Figure next on the Right-hand, and say, 6 times 7 is 42. Therefore carry 4 to 18, and that makes 22. Then say again, 6 times 2 is 12, and 2 is 14, which set down: Then add the two Rows together, and it is done.

EXAMPLES.

$$\begin{array}{r} \text{Multiplicand} \quad 34.45 \\ \text{Multiplier} \quad 3.26 \\ \hline \end{array}$$

The contracted Way. $\begin{array}{r} 34.45 \\ 6.23 \\ \hline \end{array}$

$$\begin{array}{r} 10335 \\ 689 \\ 208 \\ \hline \end{array}$$

Product 112.32

$$\begin{array}{r} 23.635 \\ 4.376 \\ \hline \end{array}$$

$$\begin{array}{r} 23.635 \\ 673.4 \\ \hline \end{array}$$

$$\begin{array}{r} 94540 \\ 7091 \\ 1653 \\ 142 \\ \hline \end{array}$$

103426 Product.

$$\begin{array}{r} \text{Multiplicand} \quad 2.38645 \\ \text{Multiplier} \quad 8.2175 \\ \hline \end{array}$$

The contracted Way $\begin{array}{r} 2.38645 \\ 5712.8 \\ \hline \end{array}$

$$\begin{array}{r} 190916 \\ 4773 \\ 239 \\ 167 \\ 12 \\ \hline \end{array}$$

Product 19.6107

$$\begin{array}{r} 375.13758 \\ 16.7324 \\ \hline \end{array}$$

$$\begin{array}{r} 375.13756 \\ 4237.61 \\ \hline \end{array}$$

$$\begin{array}{r} 37514 \\ 22508 \\ 2626 \\ 113 \\ 7 \\ \hline \end{array}$$

6276.8

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DIVISION of DECIMALS.

Division of Decimals is performed exactly in the same Manner as the Division of whole Numbers; the only Difficulty is to know the Value or Denomination of the Quotient, or how many Decimals are to be cut off. The Rule is to mark off so many decimal Places as will, with those of the Divisor, be equal in Number to those of the Dividend. Or, in other Words, you are to cut off so many Decimals in the Quotient as there are Decimals in the Dividend more than in the Divisor. Thus, suppose the Divisor is 6.3, the Dividend 945.67899. and the Quotient 1501077. Now as there is but one Decimal in the Divisor and five in the Dividend, there must be four Decimals in the Quotient, because if you add the one in the Divisor to the four in the Quotient, the Number will be five, equal to five Decimals in the Dividend.

Thus you see when there is a greater Number of Decimals in the Dividend than in the Divisor, the Excess is the Number of Decimals that ought to be in the Quotient. Therefore if the Divisor consists of more Places than the Dividend, a competent Number of Cyphers must be annexed to the Dividend, to make it consist, at least, of as many or more Places of Decimals than the Divisor; for the Cyphers which are added are to be reckoned as Decimals. As for Example, let 48 be divided by 144; now as the Divisor is greater than the Dividend, I add four Cyphers with a Dot between them, and divide according to the common Method.

$$144)48.0000(3333$$

$$\underline{432}$$

$$480$$

$$\underline{432}$$

$$480$$

$$\underline{432}$$

$$480$$

$$\underline{432}$$

$$48$$

128 Of ARITHMETIC.

Observe here, that because the Unit's Place of the Divisor falls under the first Place of the Decimals in the Dividend, therefore the first Figure in the Quotient is in the first Place of Decimals; and as there are four Places of Decimals in the Dividend, and none in the Divisor, there must be four in the Quotient.

But if 217.75 were to be divided by 65, the Unit's Place of the Divisor will fall under the Unit's Place of the Dividend, and therefore the first Figure in the Quotient will be Units.

$$\begin{array}{r} 65 \overline{) 217.75(3.35} \\ 195 \dots \end{array}$$

227

195

325

325

0

Here you may see that there are two Places of Decimals in the Dividend, and none in the Divisor; therefore the Excess of Decimal Places in the Dividend above the Divisor is two; so that when the Division is ended, separate two Places in the Quotient towards the Right-hand, by a Dot or Point, as is done above.

Divide .125 by .0457

.0457).1250000(2.735

914...

3360

3199

1610

1371

2390

2285

105

In this Example the Unit's Place of the Divisor, if there had been any, would have fallen under the Unit's Place of the Dividend; therefore the first Figure in the Quotient

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642.5

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In 78

27

548

1568

20)2116

20...

116

100

16

16

ient is Units; or, which is the same Thing, as there are seven decimal Places in the Dividend, and four in the Divisor, the Excess is three; therefore three decimal Places must be marked off in the Quotient.

When a Decimal or mix'd Number is to be divided by a Unit with Cyphers, remove the Point in the Dividend so many Places farther towards the Left-hand as there are Cyphers annexed to the Unit; prefixing Cyphers to the Dividend if need be. Thus

$$642.5 \text{ divided by } \left. \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\} \text{ quotes } \left\{ \begin{array}{l} 64.25 \\ 6.425 \\ .6425 \\ .06425 \\ .006425 \end{array} \right.$$

R E D U C T I O N.

REDUCTION when performed by Multiplication, brings a Number of a greater Denomination into a less; as Pounds to Shillings, Pence, or Farthings; Hundreds Weight into Pounds, Ounces, &c.

Deduction by Division changes a lesser into a greater Denomination; as Pence to Shillings, Drams to Ounces, &c.

Reduction by Multiplication and Division together, in the same Question, is used to turn one Sort of Money into another.

E X A M P L E S. M O N E Y.

In 784 Moidores, how many Pounds?

$$\begin{array}{r} 27 \\ \hline 5488 \\ 1568 \\ \hline \end{array}$$

$$\begin{array}{r} 20)21168(1058 \\ 20 \dots \end{array}$$

$$\begin{array}{r} 116 \\ 100 \\ \hline \end{array}$$

$$168$$

$$160 \text{ Answer } 1058 \text{ Pounds, } 8 \text{ Shillings}$$

$$8$$

In

130 Of ARITHMETIC.

£. s. d.
In 10000 12 o, how many Farthings?

20
200012 Shillings
12

400024
200012

2400144 Pence
4

9600576 Farthings

In 9600576 Farthings, how many Pounds?
4)9600576(2400144 Pence

8.....

12)2400144(200012 Shillings
24.....

16 20)200012(1000 Pounds

00014

20..

0005

12

4

—

0012 Remaind: 12 Shil

—

24

17

24

16

—

—

0

16

—

16

—

0

—

In 784 Moidores how many Guineas?

The Number of Shillings contained in 784 Moidores are 21168, therefore divide 21168 by 21.

21)21168(1008. Guineas

21...

0168

168

0

In

Of ARITHMETIC. 131

In all Questions of this Kind, the following Table will be a Guide; though it is scarce possible to mistake any Thing so easy.

Ports multiplied by 72, produce Shillings.
 Half Ports multiplied by 36, produce Shillings.
 Moidores multiplied by 27, produce Shillings.
 Guineas multiplied by 21, produce Shillings.
 Pounds multiplied by 20, produce Shillings.
 Shillings multiplied by 12, produce Pence.
 Pence multiplied by 2, produce Half-pence.
 Pence multiplied by 4, produce Farthings.
 Pounds multiplied by 240, produce Pence.
 Pounds multiplied by 960, produce Farthings.

On the Contrary.

Shillings divided by 21, quote Guineas.
 Shillings divided by 20, quote Pounds.
 Pence divided by 12, quote Shillings.
 Farthings divided by 4, quote Pence.
 Pence divided by 240, quote Pounds.
 Farthings divided by 960, quote Pounds.

CLOTH MEASURE.

Observe in this as well as in all other Reductions, how many of one Denomination make one of the other, and so multiply or divide according to the Rules aforegoing.

In 4372 Yards, how many Quarters and Ells? In this Case first multiply by 4 to bring them into Quarters, and then divide by 5 to reduce them into Ells.

$$\begin{array}{r}
 4372 \\
 \times 4 \\
 \hline
 17488 \\
 5 \overline{) 17488} \quad (3497 \\
 \underline{15 \dots} \\
 24 \\
 \underline{20} \\
 48 \\
 \underline{45} \\
 38 \\
 \underline{35} \\
 3
 \end{array}$$

Answer; 3497 Ells
 and $\frac{1}{4}$ of a Yard.

In

132 Of ARITHMETIC.

In 7862 Ells, how many Quarters and Yards?

5.

$$\begin{array}{r} 4)39310(9827 \\ 36 \dots \end{array}$$

33

33

11

8

30

28

2

Answer, 39310 Quarters or 9827 Yards and a half.

AVERDUPPOIS WEIGHT.

In 846 Hundreds, 3 Quarters and 14 Pounds, how many Pounds?

4

3384

3

3387 Quarters

28

27096

6774

94836

14

94850 Pounds

Or multiply the Sum by 112, thus, adding the 98 Pounds surplus. Thus $100 \times 846 = 84600$

$$12 \times 846 + 98 = 10250$$

94850 as before

TROY

Of ARITHMETIC. 133

TROY WEIGHT.

In 87 Pounds and 6 Ounces, how many Ounces, Penny-Weights, and Grains?

$$\begin{array}{r}
 87 \\
 12 \\
 \hline
 174 \\
 87 \\
 \hline
 1044 \\
 6 \\
 \hline
 1050 \text{ Ounces} \\
 20 \text{ Penny Weights} \\
 \hline
 21000 \\
 24 \\
 \hline
 84000 \\
 42000 \\
 \hline
 504000 \text{ Grains}
 \end{array}$$

WINE MEASURE.

In 35 Tons of Wine, how many Hogsheads, Gallons, Quarts, and Pints?

$$\begin{array}{r}
 35 \\
 4 \\
 \hline
 140 \text{ Hogsheads} \\
 63 \\
 \hline
 420 \\
 840 \\
 \hline
 8820 \text{ Gallons} \\
 4 \\
 \hline
 35280 \text{ Quarts} \\
 2 \\
 \hline
 70560 \text{ Pints}
 \end{array}$$

N

In

334 Of ARITHMETIC.

In 7464 Tuns, how many Hogsh. Galls. and Pints?

$$\begin{array}{r}
 4 \\
 \hline
 29856 \text{ Hogheads} \\
 63 \\
 \hline
 89568 \\
 179136 \\
 \hline
 1880928 \text{ Gallons} \\
 8 \\
 \hline
 15047424 \text{ Pints} \\
 \hline
 \end{array}$$

LAND MEASURE.

In 100 Miles how many Furlongs, Poles, Feet, Inches, and Barley Corns?

$$\begin{array}{r}
 100 \\
 8 \\
 \hline
 800 \text{ Furlongs} \\
 40 \\
 \hline
 32000 \text{ Poles} \\
 33 \\
 \hline
 96000 \\
 96000 \\
 \hline
 1056000 \text{ half Feet, which halved makes} \\
 528000 \text{ Feet} \\
 12 \\
 \hline
 1056000 \\
 528000 \\
 \hline
 6336000 \text{ Inches} \\
 3 \\
 \hline
 19008000 \text{ Barley Corns} \\
 \hline
 \end{array}$$



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The RULE of THREE.

THE Rule of Three is so called, because there are three Things given to find a fourth. This fourth must always bear the same Proportion to the second as the third does to the first. Likewise if the Sums are of different Denominations, the first and third must be of the same, as also the second and fourth: That is, if the first Number be Yards, the third must also be Yards; and if the second Number be Pence, the fourth must also be Pence. Thus,

If 6 Yards are worth 4 Shillings, what will 12 Yards be worth?

$\frac{4 \times 12}{6}$ That is 4 multiplied by 12, and the Product divided by 6 gives the Answer.

$$4 \times 12 = 48, \text{ and } 48 \div 6 = 8$$

It will stand better thus, $6 : 4 :: 12 : 8$

When the Question is properly stated in this Manner, the Rule is to multiply the second and third Numbers together, and to divide by the first, which will quote the Answer.

If 20s. buys 12 Yards, what will 10s. buy?

12

20

10

20)120(6 Yards

120

0

If any of the Numbers given are of two or more Denominations, reduce them to one before you proceed.

If 8 Yards cost 2*l*. 8*s*. what will 56 Yards cost at the same Rate?

N 2

Reduce

136 Of ARITHMETIC

Reduce the 2*l.* 8*s.* to Shillings, and then say,

If 8 Yards cost 48*s.* what will 56 cost, or

$$8 : 48 :: 56 : 336$$

48

448

224

8)2688(336 Shillings = 16*l.* 16*s.*

24..

28

24

48

48

0

Note, You will find an Explanation of the Signs, $\times$, $+$, $=$, &c. at the Beginning of *Algebra*.



The RULE of THREE INDIRECT.

THE Rule of *Three Indirect*, or as some call it *Inverse*, teaches from three Numbers given to find a fourth, which may be either greater or less than the second in Proportion as a third is greater or less than the first. The second and the fourth must be of the same Nature, as well as the first and the third. In this Case the first Number is to the third as the fourth to the second; and consequently, the third is to the first as the second to the fourth, or the third to the second as the first to the fourth: Therefore if you multiply the first and second together, and divide the Product by the third, you will find the fourth; which is contrary to the former Rule.

EXAMPLES.

Suppose, if I spend 60 Pence in a Day, I have Money enough to serve me 18 Months, what must I spend a Day to have it last 24 Months?

Months

If
many

In
spend
Month
have
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two fir
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the W
shews

Of ARITHMETIC. 137

Months.	Pence.	Months.
18	60	24
	18	
	480	
	60	
	24) 1080 (45 Pence	
	96	
	120	
	120	
	0	

If 72 Men can do a Piece of Work in 25 Days, in how many Days can 95 Men do the same?

Men.	Days.	Men.
72	25	95
	72	
	50	
	175	
	95) 1800 (18 Days and $\frac{20}{95} = \frac{4}{19}$	
	95	
	850	
	760	
	90	

In the first Example it is very evident that I cannot spend so much in a Day for 24 Months, as I can in 18 Months. That is, I must spend less in a Day if I would have my Money last 24 Months. Having therefore disposed the three known Numbers as above, I multiply the two first together, and divide by the last.

In the second Example, as there are more Men to do the Work they will require less Time to do it in; which shews the Reason of the Operation.

138 Of ARITHMETIC.

Suppose a Garrison has Provisions to serve 200 Men for a Year at the Time it was reinforced with 300 Men; then how long will the same Provisions serve?

$$\begin{array}{r} \text{Men} \quad \text{Days} \quad \text{Men} \\ 200 \quad \text{---} \quad 365 \quad \text{---} \quad 500 \\ \quad \quad \quad 200 \end{array}$$

$$\begin{array}{r} 500 \overline{) 73000} (146 \text{ Days} \\ 500 \dots \end{array}$$

$$\begin{array}{r} 2300 \\ 2000 \end{array}$$

$$\begin{array}{r} 3000 \\ 3000 \end{array}$$

0

$$\begin{array}{r} \text{Or thus:} \\ 2 \overline{) 00} \quad 365 \quad \text{---} \quad 5 \overline{) 00} \\ \quad \quad \quad 2 \end{array}$$

$$\begin{array}{r} 5 \overline{) 730} (146 \text{ Days} \\ 5 \dots \end{array}$$

$$\begin{array}{r} 23 \\ 20 \end{array}$$

$$\begin{array}{r} 30 \\ 30 \end{array}$$

0

A Gentleman disposed of a Horse to a Tobacconist for 167 Pounds of Tobacco, at 16 Pence a Pound. But if he did not take it immediately, he was to be paid in Proportion to the Rise or Fall of that Commodity. Through the Gentleman's Delay the Tobacco rose to 1s. and 10d. a Pound. Now how much Tobacco must the Gentleman have for his Horse,

If a Shilling is 7 Sh



Th

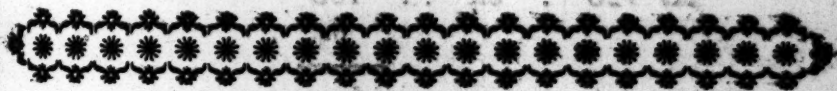
third a two last must b of the the two

OF ARITHMETIC. 139

D.	Tobacco	D.
16	167	22
	16	
	1002	
	167	
	22)2672(121 lb. and $\frac{10}{22} = \frac{5}{11}$	
	22	
	47	
	44	
	32	
	22	
	10	

If a Penny Loaf weighs 11 Ounces when Wheat is 5 Shillings a Bushel, how much must it weigh when Wheat is 7 Shillings a Bushel?

5	11	7
5		
7)55(7 Ounces, $\frac{5}{7}$		
49		
6		



The DOUBLE RULE of THREE.

THE *Double Rule of Three* teaches from five Numbers given, to find a sixth, which shall be to the third as the Product of the two first is to the Product of the two last. Therefore in order to find a sixth, the five Terms must be reduced to three; namely, by putting the Product of the two first for the first Term, and the Product of the two last for the last Term.

120 Of ARITHMETIC.

If 100*l.* in 12 Months gain 6*l.* Interest, what will 350*l.* gain in 18 Months, or

l. Mon. *l.* *l.* Months.
If 100 — 12 — 6 — 350 — 18; Or,

As 100 × 12 : 6 :: 350 × 18.

100 Pounds multiplied by 12 Months is 1200, and 350 multiplied by 18 makes 6300. Therefore the Question will be

As 1200 : 6 :: 6300

1200)37800(31 Pounds $\frac{600}{1200} = \frac{1}{2}$ or 10*s.*
3600

1800

1200

600

If a Piece of Linnen of 42 Yards in Length and 3 Quarters in Breadth cost 84 Shillings, what will a Piece of Linnen cost of 40 Yards in Length and 4 Quarters or a Yard in Breath? That is,

long.	wide.	Shil.	long.	wide.
42	3	84	40	4
3			4	
—			—	
126			160	Then,
—			—	

As 126 : 84 :: 160

84

640

1280

1280)13440(106 Shillings.

126

840

756

84

The Answer is 106*s.* and $\frac{34}{128} = \frac{17}{64} = 8d.$

THE DOUBLE RULE of THREE INDIRECT.

THE *Double Rule of Three Indirect* teaches how to find from five Numbers given, a sixth Number, which shall be to the third as the Product of the two first is to the Product of the two last. Therefore to find a sixth the five known Terms must be reduced to three, by putting the Product of the two first in the first Place, and the Product of the two last in the third Place.

If 5400 Bricks of 6 Inches long and 3 broad will pave a Hall, how many bricks are required of 9 Inches long and 4 broad to pave the same Hall.

length. breadth. Bricks. length. breadth.

6 — 3 — 5400 — 9 — 4

3 — — — — — 4

18 — — — — — 36

5400

7200

9000

36)97200(2700 Bricks.

72

252

252

0

Multiply 6 and 3 together which makes 18, and put it in the first Place. Then multiply 4 and 9 together which makes 36, which put in the third Place thus,

18 : 5400 :: 36.

Then multiply the two first and divide by the last, which will give the Answer above.

RULES

242 Of ARITHMETIC

RULES of PRACTICE.

RULES of *Practice* are only a more expeditious Way of Working the *Golden Rule*, or *Rule of Three*; the only Difference is, that in *Practice* one of the three given Terms are commonly Unity or One. That is, if one Yard cost 5 Shillings what will 678 Yards cost?

The Method of performing it is to take Notice what Parts of a Pound, or Shilling, a Yard or other Part of any particular Commodity costs; then the Number of Yards is to be divided in the same Manner, and the Answer will be Pounds or Shillings. Thus 5s. is the fourth of a Pound, and if one Yard cost 5s. what will 40 cost? Divide 40 by 4, and the Answer will be 10 L. Again, if a Yard of Ribband cost 4d. what will 81 cost? Observe that 4d. is one third of a Shilling, therefore divide 81 by 3, the Answer will be Shillings, that is 27s. When the Price is such that it will not divide the Pound or Shilling equally, perhaps it may be done at twice, thus 7s. 6d. is the fourth and eighth Parts of a Pound. Therefore if a Yard of Silk cost 7s. 6d. per Yard, what will 128 Yards cost? The fourth Part is 32, and the eighth 16, which being added together make 48, which is the Answer; that is 128 Yards will cost 48 L.

This being premised, it will be proper to take Notice of the even Parts of a Shilling, and the even Parts of a Pound: As for uneven Parts it is not worth while to puzzle your Head about them, since the common way is so ready. Thus if a Yard of Ribband cost 7d. what will 120 Yards cost? In this Case some direct to divide it into one half and one twelfth, and then the Answer will be 60 and 10, that is 70s. or 3l. 10s. Whereas it is as easy to multiply by 7 and divide by 12, and the same Answer will be obtained.

Even Parts of a Shilling.

One twelfth is 1d.
One eighth is 1d. $\frac{1}{2}$
One sixth is 2d.
One fourth is 3d.
One third is 4d.
One Half is 6d.

Even Parts of a Pound.

One Twentieth is 1s.
One sixteenth is 1s. 3d.
One fifteenth is 1s. 4d.
One twelfth is 1s. 8d.
One tenth is 2s.
One eighth is 2s. 6d.
One sixth is 3s. 4d.
One fifth is 4s.
One fourth is 5s.
One third is 6s. 8d.
One half is 10s.

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1	4
1	8

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OF ARITHMETIC. 143

But concerning this Rule, and others of the like Kind, it will be proper to observe, that as they respect particular Businesses, there is no doubt but while a Boy is serving his Apprenticeship, he will learn of Course that particular Method of Practice that is most suitable to manage his Accounts; and therefore little more needs to be said on any of these Heads. I shall therefore proceed to the Extraction of the Roots, and to lay down the Rudiments of Algebra, shewing how to resolve all common Questions in an easy *Algebraical* Manner, which may serve to excite the young Student to the Pursuit of the more difficult Parts of the Mathematics.



Of the EXTRACTION of ROOTS.

EXTRACTION of the SQUARE-ROOT.

TO extract the *Square Root* of any Square Number proposed, is to find out another Number which multiplied by itself produces the Number given. This Method supposes that we know the Roots of all Numbers, under an hundred when they have any. As for Instance, the Square of 1 is 1, the Square Root of 2 is 4, and so of the rest, as you will see in the the following Table, wherein the Squares and Cubes are placed together.

1	2	3	4	5	6	7	8	9	Root.
1	4	9	16	25	36	49	64	81	Squares.
1	8	27	64	125	216	343	512	729	Cube.

All other Numbers besides Square Numbers are called *Surd Numbers*, and will have a Fraction in the Root, the Value of which may be found to a sufficient Exactness.

The above Tables contain all the simple Numbers from 1 to 9 inclusively and their Squares over against them, which have been found by multiplying each Root by itself. Hence it appears that a Number consisting of two Figures only can have but one in the Root.

A TABLE

144 OF ARITHMETIC.

A TABLE, shewing the Squares and Cubes of all Numbers from 1 to 200.

Root	Square	Cube	Root	Square	Cube
1	1	1	36	1296	46656
2	4	8	37	1369	50653
3	9	27	38	1444	54872
4	16	64	39	1521	59319
5	25	125	40	1600	64000
6	36	216	41	1681	68921
7	49	343	42	1764	74088
8	64	512	43	1849	79507
9	81	729	44	1936	85184
10	100	1000	45	2025	91125
11	121	1331	46	2116	97336
12	144	1728	47	2209	103823
13	169	2197	48	2304	110592
14	196	2744	49	2401	117649
15	225	3375	50	2500	125000
16	256	4096	51	2601	132651
17	289	4913	52	2704	140608
18	324	5832	53	2809	148877
19	361	6859	54	2916	157464
20	400	8000	55	3025	166375
21	441	9261	56	3136	175616
22	484	10648	57	3249	185193
23	529	12167	58	3364	195112
24	576	13824	59	3481	205379
25	625	15625	60	3600	216000
26	676	17576	61	3721	226981
27	729	19683	62	3844	228328
28	784	21952	63	3969	250047
29	841	24389	64	4096	262144
30	900	27000	65	4225	274625
31	961	29791	66	4356	287496
32	1024	32768	67	4489	300703
33	1089	35937	68	4624	314432
34	1156	39304	69	4761	338509
35	1225	42875	70	4900	343000

Root
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110

Of ARITHMETIC. 145

Root	Square	Cube	Root	Square	Cube
71	5041	357911	111	12321	1367631
72	5184	373246	112	12544	1404928
73	5329	389017	113	12769	1442857
74	5476	405224	114	12996	1481544
75	5625	421875	115	13225	1520875
76	5776	438976	116	13456	1560896
77	5929	456533	117	13689	1601613
78	6084	474552	118	13924	1643032
79	6241	493039	119	14161	1685159
80	6400	512000	120	14400	1728000
81	6561	531441	121	14641	1771561
82	6724	551368	122	14884	1815848
83	6889	571787	123	15129	1860867
84	7056	592704	124	15376	1906624
85	7225	614125	125	15625	1953125
86	7396	636056	126	15876	2000376
87	7569	658503	127	16129	2048387
88	7744	681472	128	16384	2097152
89	7921	704969	129	16641	2146689
90	8100	729000	130	16900	2197000
91	8281	753571	131	17161	2248091
92	8464	778688	132	17424	2299968
93	8649	804357	133	17689	2352637
94	8836	830584	134	17956	2406104
95	9025	857375	135	18225	2460375
96	9216	884736	136	18496	2515456
97	9409	912673	137	18769	2571353
98	9604	941192	138	19044	2628072
99	9801	970299	139	19321	2685619
100	10000	1000000	140	19600	2744000
101	10201	1030301	141	19881	2803221
102	10404	1061208	142	20164	2863288
103	10609	1092727	143	20449	2924207
104	10816	1124864	144	20736	2985984
105	11025	1157625	145	21025	3048625
106	11236	1191016	146	21316	3112136
107	11449	1225043	147	21609	3176523
108	11664	1259712	148	21904	3241792
109	11881	1295029	149	22201	3307949
110	12100	1331000	150	22500	3375000

146 Of ARITHMETIC.

Root	Square	Cube	Root	Square	Cube
151	22801	3442951	176	30976	5451776
152	23104	3511808	177	31329	5545233
153	23400	3581577	178	31684	5639752
154	23716	3652264	179	32041	5735339
155	24025	3723875	180	32400	5832000
156	24336	3796416	181	32761	5929741
157	24649	3869893	182	33124	6028568
158	24964	3944312	183	33489	6128487
159	25281	4019679	184	33856	6229504
160	25600	4096000	185	34225	6331625
161	25921	4173281	186	34596	6434856
162	26244	4251528	187	34969	6539203
163	26569	4330747	188	35344	6644672
164	26896	4410944	189	35721	6751269
165	27225	4492125	190	36100	6859000
166	27556	4574296	191	36481	6967871
167	27889	4657463	192	36864	7077888
168	28224	4741632	193	37249	7189057
169	28561	4826809	194	37636	7301384
170	28900	4913000	195	38025	7414875
171	29241	5000211	196	38416	7529536
172	29584	5088448	197	38809	7645373
173	29929	5177717	198	39204	7762392
174	30276	5268024	199	39601	7880599
175	30625	5359375	200	40000	8000000

If you have a Mind to prove whether this Table of Square Numbers is true, you have nothing to do but double the Root, and then add one to it; add this to the Square of that Root, and it will produce the next. Thus 90 doubled is 180, and 1 is 181, which added to 8100 makes 8281 the Square of 91. By this Means you may readily make Squares to as high a Number as you please.

If you have a Mind to examine the Truth of the Cube Numbers, or to make a large Table which shall run much higher than this; it may be done in the following Manner. When you have found the Cube of a , that is aaa of any Number you please, you must add three times the Square of a to more three times a more 1. That is $3aa+3a+1$. And then the Sum $aaa+3aa+3a+1$ will give you the Cube of $a+1$, which follows next the Side of a the known Cube aaa .

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three
more
the C
the C
Cube
Cube
times
Sum
Th
braic

Sides

1

2

3

4

5

Wh
any N
Point o
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Of ARITHMETIC. 147

As for Example, The first Cube is 1, to which if you add three times the Square of 1, the Side of the Cube of 1, more 4, which contains three times the same Side 1, more the Cube of 1, another Unit, the Sum will be 8, which is the Cube of 2, the Number next above 1. And if to the Cube 8 you add three times the Square of the Side of the Cube, which is 3 times 4 = 12 more 7, which is three times the Side, with the Addition of the Cube of an Unit, the Sum will be 27 the Cube of 3, the next Number above 2.

The following Table, with a Knowledge of the Algebraic Signs, will make it quite plain.

Sides	Cubes	Sides	Cubes
1	$1 = aaa$ $+ 3 = 3aa$ $+ 4 = 3a + 1$	999	$997002999 = aaa$ $+ 2994003 = 3aa$ $2998 = 3a + 1$
2	$8 = bbb$ $+ 12 = 3bb$ $+ 7 = 3b + 1$	1000	$1000000000 = bbb$ $+ 3000000 = 3bb$ $3001 = 3b + 1$
3	$27 = ccc$ $+ 27 = 3cc$ $+ 10 = 3c + 1$	1001	$1003003001 = ccc$ $\times 3006003 = 3cc$ $+ 3004 = 3c + 1$
4	$64 = ddd$ $+ 48 = 3dd$ $+ 13 = 3d + 1$	1002	$1006012008 = ddd$ $+ 3012032 = 3dd$ $+ 3007 = 3d + 1$
5	$125 = eee$ $+ 75 = 3ee$ $+ 16 = 3e + 1$	1003	1009027027 3018027 3010
	216 the Cube of 6.		1012048064 the Cube of 1004.

When you are about to extract the Square Root from any Number you must point it; that is, you must make a Point or Dot over every second Figure, beginning at the Place of Units. Then seek the greatest Square Number in the first Point towards the Left hand, and place that Square

148 Of ARITHMETIC.

Number under the first Point, and the Root in the Quotient. Subtract the said Square Number from the Point, and to the Remainder bring down the next Point. Call this the *Resolvend*. Then double the Quotient, and place it for a Divisor on the Left-hand of the Resolvend, and seek how often the Divisor is contained in the Resolvend; omitting the Units Place, putting the Answer in the Quotient, and likewise on the Right-hand of the Divisor. Then multiply the whole Divisor by the last Figure put in the Quotient, and subtract the Product from the Resolvend. Then bring down the next Point to the Remainder, if any, and proceed as before.

Let 4489 be the Number given, and the Work will stand thus.

$$\begin{array}{r}
 \cdot \cdot \\
 4489 \overline{) 67} \\
 \underline{36} \\
 127 \overline{) 889} \text{ Resolvend} \\
 \underline{889} \text{ Product} \\
 \hline
 .0.
 \end{array}$$

First Point or Dot the given Number as before directed, then seek the greatest Square Number in 44, you will find by the Table that it is 36, and that 6 is the Root: Place 36 under 44, and 6 in the Quotient, then subtract 36 from 44, and there remains 8. To that 8 bring down the other Point 89. placing it on the Right-hand, and then it will make 889, for a Resolvend. Afterwards double the Quotient 6 and it will make 12, which place on the Left-hand of the Resolvend for a Divisor, and seek how many times 12 is in 88, and the Answer is 7. Put this in the Quotient and on the Right-hand of the Divisor. Multiply 127 by 7, and the Product will be 889. Subtract this from the Resolvend, and nothing will remain, which shews your Work is done, and that the Square Root of 4489 is 67, as you may see in the preceding Table. Or you may multiply 67 by 67, and the Product will be 4489.

OF ARITHMETIC. 149

EXAMPLES.

$$\begin{array}{r} 61504(248 \\ 4 \end{array}$$

$$\begin{array}{r} 44) 215 \\ 176 \end{array}$$

$$\begin{array}{r} 488) 3904 \\ 3904 \end{array}$$

0

$$\begin{array}{r} 106929(327 \\ 9 \end{array}$$

$$\begin{array}{r} 62) 169 \text{ Resolvend} \\ 124 \text{ Product} \end{array}$$

$$\begin{array}{r} 647) 4529 \text{ Resolvend} \\ 4529 \text{ Product} \end{array}$$

0

In the second Example point or dot the given Number as above; then seek what is the greatest Square in 10, which is 9, and 3 is the Root. Place 9 under 10 and 3 in the Quotient; then subtract 9 from 10 and 1 will remain. To which bring down 69 the next Point; and there will be 169 for the Resolvend. Double 3 the Quotient and it will make 6, which place on the Right-hand of the Resolvend for a Divisor. Then ask how many times 6 is in 16, the Answer is twice. Put two in the Quotient and also at the Right-hand of the Divisor. Then multiply 62 by that 2, and the Product will be 124. Subtract this from the Resolvend, and the Remainder will be 45. Bring 29 to 45, and the Sum will be 4529 for a new Resolvend. Then double 32 in the Quotient, and place it on the Left-hand of the new Resolvend for a Divisor. Then ask how many times 64 is in 452, and the Answer will be 7. Put 7 in the Quotient, and also on the Right-hand of the Divisor, and it will make 647, which being multiplied by the 7 in the Quotient, will make 4529. Subtract this Number from the Resolvend, and nothing will remain; insomuch that the 327 is the Square Root of the Number given, which you may prove by multiplying it into itself.

150. Of ARITHMETIC.

Extract the Square of

$$\begin{array}{r} \cdot \cdot \cdot \cdot \\ 346921(589 \\ \underline{25} \end{array}$$

$$\begin{array}{r} 108) 969 \text{ Resolvend} \\ 864 \text{ Product} \\ \hline \end{array}$$

$$\begin{array}{r} 1169) 10521 \text{ Resolvend} \\ 10521 \text{ Product} \\ \hline 0 \end{array}$$

$$\begin{array}{r} \cdot \cdot \cdot \cdot \\ 22174681(4709 \\ \underline{16} \end{array}$$

$$\begin{array}{r} 87) 617 \\ 609 \\ \hline \end{array}$$

$$\begin{array}{r} 940) 846 \\ 000 \\ \hline \end{array}$$

$$\begin{array}{r} 9409) 84681 \\ 84681 \\ \hline 0 \end{array}$$

$$\begin{array}{r} \cdot \cdot \cdot \cdot \\ 725991(852 \\ \underline{64} \end{array}$$

$$\begin{array}{r} 165) 859 \\ 825 \\ \hline \end{array}$$

$$\begin{array}{r} 1702) 3491 \\ 3404 \\ \hline \end{array}$$

87 The Remainder.

In the last Example the Remainder is 87, which after the Root is doubled makes this Fraction $\frac{87}{1702}$. But if you are desirous of being more exact, you may add two Cyphers to the Remainder, and to the Remainder add two more. Make a Point to the Right-hand of the Root found, which is the greatest whole Number in the Root, and all the Figures after the Point are Decimals. The following is an Example of this Kind.

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Cube R
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Number
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putting t

Of ARITHMETIC. 151

$$\begin{array}{r}
 \overset{\cdot}{3}\overset{\cdot}{5}\overset{\cdot}{6}89(188.91 \\
 \hline
 28)256 \\
 \underline{224} \\
 368)3289 \\
 \underline{2944} \\
 3769)34500 \\
 \underline{33921} \\
 37781)57900 \\
 \underline{37781} \\
 20119
 \end{array}$$

To extract the Square Root of a Fraction, the best Way is to reduce it to a Decimal. Thus $\frac{7}{8}$ being so reduced, will make .875, to which annex Cyphers and the Root will be .9354.

EXTRACTION of the CUBE ROOT.

The *Cube* is a geometrical Body of three Dimensions, namely Length, Breadth, and Thickness, like a Die, and has six Sides, each of which is a perfect Square. The *Cube Root* of any Number is a Number which multiplied by itself, and the Product multiplied again by the same Number produces the Number proposed. Thus 3 Times 3 is 9, and 3 Times 9 is 27. Therefore 3 is the Cube Root of 27.

Place a Point or Dot over every third Figure, beginning at the Place of Units, and as many Dots as are thus placed, of so many Figures will the Root consist. Then seek in the Table of Cubes the next less Cube of the first Period of the given Number on the Left-hand. Set the Cube under the first Period, and place the Root in the Quotient. Subtract the Cube from the first Period, and to the Remainder bring down the next Period, and call the Sum the Resolvend, drawing a Line under it. This done, square the Figure in the Quotient, and multiply the Square by 300, putting the Product under the Resolvend. Then multiply the

152 Of ARITHMETIC.

the Figure in the Root by 30, and place it under the last Product. The Sum of these Products is the Divisor, under which draw a Line. Seek how many times this Divisor can be had in the Resolvend, and this is the second Figure of the Root, which place in the Quotient. Multiply this last Figure in the Quotient by itself, and place the Product under the Divisor. Then multiply that part of the Divisor which arises by multiplying the former Figure in the Quotient by 30 by the last Figure in the Root, and place the Product under the last Product, adding them together. Under these place the other Part of the Product, and add them together. Multiply the last Figure in the Quotient, and call the Product the *Subtrahend*, which is to be subtracted from the Resolvend. If the Root consists of two Places only the Work is done.

EXAMPLES.

592704(84
512

80704 Resolvend

19200 The Product of the Square of 8 or 64 by 300

240 The Product of 8 by 30.

19440 Sum the Divisor.

16 The Product of 4 by 4.

960 The Product of 240 by 4.

19200 The other Part of the Product.

20176 The Sum to be multiplied by 4, which is the last
4 Figure in the Quotient.

80704

o and therefore nothing remains.

4096(1
1
3096 R
300 T
30 T
330 S
36 P
180 P
300 T
516 S
6
3096 S

157464
125
32464
7500
150
7650
16
600
7500
8116
4

32464
Thou
ficiently
Learner.

Of ARITHMETIC. 153

An easier EXAMPLE.

4096(16

1

3096 Resolvend.

300 The Product of the Square of 1 by 300;

30 The Product of 1 by 30.

330 Sum the Divisor.

36 Product of 6 by 6.

180 Product of 30 by 6.

300 The other Part of the Product.

516 Sum to be multiplied by 6.

6

3096 Subtrahend equal to the Resolvend.

Another EXAMPLE.

157464(54

125

32464 Resolvend.

7500 The Product of the Square of 5 by 300.

150 The Product of 5 by 30.

7650 Divisor.

16 The Product of 4 by 4.

600 The Product of 150 by 4.

7500 The other Part of the Product.

8116 The Sum to be multiplied by 4, the last Figure
4 in the Quotient.

32464 Subtrahend equal to the Resolvend.

Though these three Examples render this Method sufficiently clear, yet I shall give another to exercise the Learner.

To

154 Of ARITHMETIC.

To extract the Cube Root of 75686967.

7 686967(423
64

11686 Resolvend

4800 Product of the Square of 4 by 300.

120 Product of 4 by 30.

4920 Divisor.

4 Square of 2

240 Product of 120 by 2.

4800 The other Part of the Product.

5044 Sum

2 Multiply by 2 the last Figure placed in the Quotient.

10088 Subtrahend to be taken from the Resolvend.

1598967 Resolvend being the Remainder with the next
Period brought down.

529200 } Product of 300 by 1764 the Square of 42, the
Figures in the Quotient.

1260 Product of 42 by 30.

530460 Divisor.

9 Square of 3.

3780 Product of 1260 by 3.

529200 The other Part of the Product.

532989 Sum

3 The Figure last placed in the Root.

1598967 Subtrahend.

The Learner may perceive by this last Example that all the Figures then in the Quotient must be squared, and their Squares multiplied by 300, as also that the same Figures multiplied by 30 must be added to the former Product to

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gure mul
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that the
the Subtr



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or Litera
Numer

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Quantity
Ancients

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to make a new Divisor. When it is known how many Times this Divisor can be had in the Resolvend, that Figure must be set in the Quotient, and he must proceed with it as before, to gain a new Subtrahend. Remember always that the two principal Things are to gain the Divisor and the Subtrahend.



ALGEBRA.

ALGEBRA is the Method of solving Problems by Equations, and is of two Kinds, *Numeral*, and *Specious* or *Literal*.

Numeral Algebra, is that wherein all the given Quantities are represented by Numbers, and the unknown Quantity by a Letter or other Symbol, as was used by the Ancients.

Specious or *Literal Algebra* is that wherein all the Quantities, as well known as unknown, are expressed by Letters of the Alphabet. The first Letters of the Alphabet are generally used to express Numbers and Quantities given and known, while the last Letters of the Alphabet are mostly employed to represent Numbers or Quantities unknown, and which are to be sought, as x , y , z .

In order to resolve all sorts of Questions, we are supposed to understand Addition, Subtraction, Multiplication, and Division, as well of Fractions as whole Numbers: And to put these Rules in Practice, we must be well acquainted with the Algebraic Signs, which have been introduced for the Sake of Brevity, and to shorten the Calculations.

ALGEBRAIC SIGNS.

$\left\{ \begin{array}{l} \text{Plus or more, is the Sign of Addition, and shews that} \\ \text{the Numbers connected together with it are to be} \\ \text{added; as } 7+8+6 \text{ are to be added together; it} \\ \text{also serves to express the Addition of one Quantity} \\ \text{to another, as } a+b+c+x; \text{ it likewise signifies an} \\ \text{affirmative Quantity.} \end{array} \right.$

$\{-$ *Minus*, or *less*, serves to shew that the Number or Quantity which immediately follows it, is to be taken from that which precedes it, as $9-4$ is to be read 9 *minus* or *less* four, which signifies that four is to be taken from nine; likewise $a-b$ shews that b is to be subtracted from a : it likewise signifies a negative Quantity.

$=$ Signifies *equal to*; it is of very great Use in common Arithmetic as well as Algebra, and serves to shew the Equality between several Numbers or Quantities; $4+5=3+6$, four *plus* five is equal to three *plus* six. *Equality* is composed of two Members, whereof one is placed to the Right, and the other to the Left; as $x=20$, or $z=a$, or $x+y=a+b$, or $x-y=a-b$.

$\times$ Denotes *Multiplication*, and shews that the Numbers on each Side it are to be multiplied into each other, as 6×8 , or $a\times x$. But when Quantities are simple it is commonly expressed by joining the Letters together, as ax .

$\div$ Signifies *Division*. Thus $32\div 4$ implies that 32 is to be divided by 4, or $a\div b$ by b . But in Algebra Division is generally expressed like a Fraction, as $\frac{a}{b}$.

$::$ This is placed between two Pair of Proportionals, when there is not the same Proportion between all the four Terms. Thus $2:4::8:16$, as 2 is to 4, so is 8 to 16; or $a:b::e:d$, as a is to b , so is c to d .

$:::$ Is a Sign of Arithmetical Proportion.

$:::$ Denotes Geometrical Proportion.

$\therefore$ Signifies *ergo*, or therefore.

Besides $a+b\times c$ denotes the Product of the Compound Quantity $a+b$ by the simple Quantity c ; and $a+b+c\times a-b+c\times a+c$ represent the Product of the three compound Quantities.

When a Quantity is to be multiplied into itself, or raised to any Power, then a Line may be drawn over the given Quantity, and at the End thereof place the Index of the Power: Thus $\overline{a+b}^2$ signifies the same as $a+b\times a+b$, *viz.* the second Power or Square of $a+b$ considered as one Quantity. Likewise $\overline{ab+bc}^3$ denotes the same as $\overline{ab+bc}\times\overline{ab+bc}\times\overline{ab+bc}$, namely the third Power or Cube of

of $ab \times bc$. However in simple Quantities the Line at the Top is omitted. Thus, a^2 signifies the same as aa , or $a \times a$; and b^3 the same as bbb , or $b \times b \times b$.

The Sign $\sqrt{\quad}$ is used to express the Square Root of any Quantity as $\sqrt{25}$ signifies Square Root of 25, which is 5, because $5 \times 5 = 25$. And $\sqrt{\frac{abc + aac}{b}}$ expresses the

Square Root of $\frac{abc + aac}{b}$ or of the Quantity which arises from the Division of $abc + aac$ by b . But if it had been wrote thus $\sqrt{\frac{abc + aac}{b}}$ having the Line

which separates the Denominator from the Numerator drawn below $\sqrt{\quad}$, then it signifies that the Square Root $abc + aac$ may be first taken, and afterwards divided by b .

The same Mark with a Figure over it is made use of to express the Cube or Biquadratic Root of any Quantity;

thus $\sqrt[3]{64}$ signifies the Cube Root of 64, which is 4. For $4 \times 4 \times 4$ is 64. And $\sqrt[3]{ab + cd}$ the Cube Root of $ab + cd$.

Also $\sqrt[4]{81}$ denotes the Biquadratic Root of 81, which is 3. For $3 \times 3 \times 3 \times 3$ is 81. And $\sqrt[4]{ab + cd}$ denotes the Biquadratic Root of $ab + cd$. This Sort of Quantities, when the Root cannot be extracted, are called *Surds*, or *Surd Quantities*. When the Terms are single, as $\sqrt{2}$ or $\sqrt{ab}$, they are *simple Surds*. When the Quantity is composed of several Terms or Members connected together by Signs, they are *compound* or *universal Surds*.

Some express the Square Root of a , or $\sqrt{a}$, by $\overline{a}^{\frac{1}{2}}$. Because they make $\frac{1}{2}$ to signify the Square Root, $\frac{1}{3}$ the Cube, and $\frac{1}{4}$ the Biquadratic. As also $\frac{2}{3}$ the Square of the Cube, expressed thus $\overline{a}^{\frac{2}{3}}$. Moreover $\overline{a+z}^{\frac{7}{4}}$ signifies the seventh Power of $a+z$, $\frac{1}{4}$ the Biquadratic Root of $a+z$.

When any Quantity is to be taken more than once, the Number is to be prefixed, which shews how many Times it is to be taken. Thus $5a$ shews, that a is to be taken 5 Times. Also $7\sqrt{aa+bb}$ signifies that $\sqrt{aa+bb}$ is to be taken 7 Times. The Numbers, thus prefixed, are

called *Coefficients*. And when there is none, a Unit is always understood.

Those Quantities are alike which are expressed by the same Letters under the same Power, and which differ only in the Coefficients. Thus $3bc$, $5bc$, and $8bc$ are like Quantities.

The following are Examples, wherein the Signification of each is expressed in Numbers, which being well considered, and thoroughly understood, will render the whole very easy. I have made use of the lowest Numbers, that the Computations may be the more readily made.

Suppose $a=4$, $b=3$, $c=2$. Then will

$$aa+3ab-cc=16+36-4=48$$

$$2aaa-2ab+ccc=128-24+8=112.$$

$$aa \times a + b = 16 \times 7 = 112$$

$$\frac{aaa+c}{a+c} - cc = \frac{64+2}{4+2} - 4 = 7.$$

$$\sqrt{2aa+cc} \text{ or } \sqrt{2aa+cc}^{\frac{1}{2}} = \sqrt{36} = 6.$$

$$\sqrt[3]{3aa+8c} \text{ or } \sqrt[3]{3aa+8c} = \sqrt[3]{64} = 4. \text{ For } 4 \times 4 \times 4 = 64.$$

$$c + \frac{5bc}{\sqrt{2aa+cc}} = 2 + \frac{30}{6} = 7.$$

$$\frac{2aa-bb-ac}{2a-bb+3c} = \frac{15}{5} = 3.$$

$$\sqrt{bb-ac} + \sqrt{2ac+bb} = 1+5=6.$$

$$bb-ac+2ac+5cc=9-8+16+20=37.$$

$$\sqrt{bb+5ac} + \sqrt{bb-ac} = 7+1=8.$$



ALGEBRAIC ADDITION.

Algebraic Addition supposes that different Quantities are to be brought into one Sum equal to the Value of them all. This may be done simply by the Sign $+$ or $-$, as $a+b+c-d$; as also by uniting those that have the same Denomination; for Instance, by writing $7a$ instead of $4a+3a$.

But

But observe, when a Quantity of the same Denomination is repeated several Times with different Signs, the lesser Quantity is to be subtracted from the greatest, and the Remainder must have the Sign of the greatest Number.

EXAMPLES.

$$\begin{array}{r} a+5b \\ a+4b \end{array} \left. \vphantom{\begin{array}{r} a+5b \\ a+4b \end{array}} \right\} \text{Quantities to be added together.}$$

$$2a+9b \text{ The Sum.}$$

$$\begin{array}{r} 5a+6b \\ 4a+4b \end{array} \left. \vphantom{\begin{array}{r} 5a+6b \\ 4a+4b \end{array}} \right\} \text{To be added.}$$

$$9a+10b \text{ The Sum.}$$

$$\begin{array}{r} 5a+3b+5d+2d \\ 6a+7b+3d+10f \end{array} \left. \vphantom{\begin{array}{r} 5a+3b+5d+2d \\ 6a+7b+3d+10f \end{array}} \right\} \text{To be added.}$$

$$11a+10b+10d+10f \text{ The Sum.}$$

$$\begin{array}{r} 3a-5e+3f-5g \\ 5a+4e-2f+7g \end{array} \left. \vphantom{\begin{array}{r} 3a-5e+3f-5g \\ 5a+4e-2f+7g \end{array}} \right\} \text{To be added.}$$

$$8a-e+f+2g \text{ The Sum.}$$

It is hardly necessary to observe, that when more $4e$ and less $5e$ are added together, the Sum is $-e$, because the Reason is so obvious. When the Quantities are of different Denominations you must proceed thus,

$$\begin{array}{r} 3a+3b-3c \\ 6c-5d+4f \\ 4c-5f+2g \end{array} \left. \vphantom{\begin{array}{r} 3a+3b-3c \\ 6c-5d+4f \\ 4c-5f+2g \end{array}} \right\} \text{To be added.}$$

$$3a+3b+7c-5d-f+2g \text{ The Sum.}$$

$$\left. \begin{array}{r} 3aa + 3ab - bb \\ 15ab - 5aa + 3ff \\ gb + 7bb - 2fg \end{array} \right\} \text{To be added.}$$

$$18ab - 2aa + 6bb + 3ff - 2fg + gb \text{ The Sum.}$$

$$\left. \begin{array}{r} 3abc - ffh + fgg \\ abd - abc + 3ffg \end{array} \right\} \text{To be added.}$$

$$2abc + abd + 3ffg + fgg - ffh \text{ The Sum.}$$



ALGEBRAIC SUBTRACTION.

Algebraic Subtraction is commonly performed by Means of the Sign (—) when the Quantities to be subtracted are positive: As for Instance, suppose I was to subtract $x + y$ from $a + b$, the Remainder will be $+ab - x - y$. But it is done by the Sign (+) when the Quantities to be subtracted are negative; for if $-x$ and $-y$ were to be taken from $a + b$ the Remainder will be $a + b + x + y$. And here it will be proper to observe, that all positive Quantities that are to be subtracted must have their Signs altered from *more* into *less*; and all negative Quantities that are to be subtracted must have their Signs changed from *less* into *more*.

EXAMPLES.

$6a$	$8aa$	$12abb$	$3a$	$8ab + 2bb + 4cc$
$2a$	$3aa$	$4abb$	$2b$	$2ab - 3bb - 2cc + 3cd$
$4a$	$5aa$	$8abb$	$3a - 2b$	$6ab + 5bb - 6cc - 3cd$

It often happens that a greater Quantity is to be taken from a less, which is absolutely impossible, and therefore the lesser may be taken from the greater, and the Remainder must have the Sign (—) prefixed. Thus if you take $5a$ from $3a$, the Remainder will be $-2a$. Take $10bb$ from $3bb$ and the Remainder will be $-7bb$, and so of the Rest.

ALGEBRAIC MULTIPLICATION.

Algebraic Multiplication serves to find the Product of two Quantities expressed by one or more Terms, in-
somuch that the Product shall be, with regard to one of
these given Quantities, what the other is with Respect to
Units.

This Multiplication is performed by placing the Letters
close together that are to be multiplied; as for Example,
if you were to multiply a into b , the Product will be ab ;
or if you intend to multiply ab into x , the Product will be
 abx .

You must always remember in Multiplication, that *like*
Signs multiplied together produce $(+)$ and that *unlike Signs*
multiplied together produce $(-)$. For instance, suppose
 $+a+b$ were to be multiplied together, they would pro-
duce $+ab$. Likewise if you multiply $-a$ and $-x$ together,
the Product will be $+ax$. But if you multiply $+a$ by
 $-b$, the Product will $-ab$, because the Signs are unlike.
Observe likewise, that if there are any Digits prefixed, they
must be multiplied in the common Manner.

E X A M P L E S.

$2a$	$2aa$	$9aa$	$18aabc$
$3a$	$4aa$	$3a$	$4aacd$

$6aa$ Product. $8aaaa$ or a^4 $27aaa$ or a^3 $72aaaaabccd$ or $72a^4bccd$

$a+b$	$a+b$	$a-b$
$a-b$	$a+b$	$a-b$

$-ab-bb$	$ab+bb$	$-ab+bb$
$aa+bb$	$aa+ab$	$aa-ab$

$aa-ab$ Product.	$aa+2ab+bb$	$aa-2ab+bb$
$aa+2ab+bb$	$aa+2ab+bb$	$aa-2ab+bb$
$a+b$	$a+b$	$a-b$

$aab+2abb+bbb$	$-aab+2abb-bbb$
$aaa+2aab+abb$	$aaa-2aab+abb$

$aaa+3aab+3abb+bbb$	$aaa-3aab+3abb-bbb$
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EXAMPLES of *Complex Numbers.*

Suppose it was proposed to multiply $cc+cd+dd$ by $c-d$, the Operation will stand thus;

$$\begin{array}{r}
 cc+cd+dd \\
 c-d \\
 \hline
 ccc-ccd-cd1 \\
 -ccd-cdd-ddd \\
 \hline
 ccc \quad * \quad * \quad -ddd
 \end{array}$$

Therefore the Product is $ccc-ddd$.

Again,

$$\begin{array}{r}
 7a-4b+8c \\
 9a-8b \\
 \hline
 63aa-36ab+72ac \\
 -56ab+32bb-64bc \\
 \hline
 63aa-92ab-32bb,-64bc,+72ac
 \end{array}$$

Observe, that in literal Multiplication, as above, it is sufficient to join the Letters to each other, without troubling your Head about the Signification, the Value, or their Order, which is always arbitrary. But the Expression may often be abridged, for instead of aaa , you may put a^3 , instead of $aaaa$, a^4 ; instead of bbb , b^3 ; instead of $bbbb$, b^4 , and the like.



ALGEBRAIC DIVISION.

Algebraic Division is the opposite of Multiplication, and is generally performed by setting the Divisor under the Dividend with a Line between. As for Example, suppose a was to be divided by x , the Quotient will be $\frac{a}{x}$. In Division, as well as Multiplication *like* Signs give $+$, and *unlike* Signs $-$.

If two given literal Quantities are preceded by Numbers, they must be divided by each other, and the Quotient must be placed on the Left-hand of the Letters. As for Example, $16ab$ being given to be divided by $4ab$, the Quotient will be $4ab$; or if $32aab$ was to be divided by $8aab$, the Quo-

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Of ALGEBRA.

163

Quotient will be $4aab$. But observe, if one or more Letters of the same Kind are found both in the Dividend and the Divisor, they must be struck out in both. Thus if abb is to be divided by abc the Product will be $\frac{b}{c}$.

EXAMPLES.

$$\begin{array}{r} 20a \overline{) 5a} \\ 4a \end{array} \qquad \begin{array}{r} 6aaaabbb \overline{) 3aabb} \\ 2ab \end{array}$$

$$\begin{array}{r} 12aaaaabbbb \overline{) 47aaaabb} \\ 3abb \end{array}$$

$$\begin{array}{r} 8aabbbb \overline{) 2abbbb} \\ 4abc \end{array}$$

$$\begin{array}{r} 13aaaaabbb \overline{) 13aaab} \\ 6abb \end{array}$$

Note, I have wrote the Letters at length, that the Examples might be more readily understood; as also in the following Examples, which are moreplex.

Suppose we were to divide $72a-56b$ by 8. They may be placed as in common Division.

$$8 \overline{) 72a-56b} \quad 9a-7b$$

Again,

$$\begin{array}{r} 5a-6b \overline{) 35aa-62ab-24bb} \quad 7a-4b. \\ 35aa-42ab \end{array}$$

$$\begin{array}{r} 20ab+24bb \\ 20ab+24bb \end{array}$$

0 0

Ask how many Times $5a$ may be had in $35aa$, the Answer is $7a$. Put that in the Quotient, and multiply the whole Divisor therewith, and the Product will be $35aa-42ab$. Subtract this as in the Example, and the Remainder will be $-20ab$. Bring down $24bb$, as you see above. Ask how many Times $5a$ can be had in $20ab$, the Answer will be $-4b$. Put that in the Quotient and multiply it by $5a-6b$, and the Product will be $20ab+24bb$; which placed under the former, and subtracted, nothing will remain.

E X-

EXAMPLE of *Literal Complex Quantities.*

$$c-d)ccc-ddd(cc+cd+dd$$

$$ccc-ccd$$

$$0+ccd-ddd$$

$$+ccd-cdd$$

$$+cdd-ddd$$

$$+cdd-ddd$$

$$0 \quad 0$$

Algebraic INVOLUTION and EVOLUTION.

INVOLUTION is the Raising of Powers from any proposed Root; if therefore the Root or Quantity is to be involved, it may be performed by adding the same Letter for every Power; Thus if a be the given Quantity, then aa will be the second Power or Square; aaa the third or Cube, $aaaa$ the fourth or Biquadratic, &c. But they are commonly written a^2 , a^3 , a^4 , a^5 , a^6 , &c.

But if the Quantity proposed be itself a Power or Surd, it will be involved by multiplying its Exponent by the Exponent of the proposed Power. Thus the Cube or third Power of a^2 , is a^6 , and the sixth Power of c^3 is c^{18} . Besides the fourth Power of $by+xx$ is $by+xx$. Lastly, the third Power of $a-b$ is $a-b$.

A Quantity composed of several Factors multiplied continually together, is involved by raising each Factor to the Power proposed. Thus the Square or second Power of ab is $aabb$ or $a^2 b^2$. The third Power of abc is $8aaabbbccc$ or $8a^3 b^3 c^3$. Also the fifth Power of $\frac{3a \times aa-xx}{x a + b \times c}$ is expressed by $243a \times aa-xx$ $\times a + b \times c$.

A Fraction is involved by raising both the Numerator and Denominator to the Power proposed. Thus $\frac{a}{b}$ being involved to the second Power gives $\frac{aa}{bb}$; and $\frac{2ab}{3c}$ involved to the third Power gives $\frac{8a^3 b^3}{27c^3}$.

QUESTIONS in ALGEBRA. 165

Quantities compounded of several Terms are involved by an actual Multiplication of all their Parts. Thus if $a+b$ is multiplied into itself it will stand thus.

$$\begin{array}{r} a+b \\ a+b \\ \hline aa+ab \\ \quad +ab+bb \end{array}$$

$aa+2ab+bb$ the Square or second Power.

$$\begin{array}{r} a+b \\ \hline aaa+2aab+abb \\ \quad +aab+2abb+bbb \end{array}$$

$aaa+3aab+3abb+bbb$. the Cube, or third Power.

$$\begin{array}{r} a+b \\ \hline aaaa+3aaab+3aaabb+abbb \\ \quad aaab+3aabb+3abbb+bbbb \end{array}$$

$aaaa+4aabb+6aabb+4abbb+bbbb$. the fourth.

You may proceed in the same Manner as high as you please. When $a-b$ is involved, the Square will be $aa-2ab+bb$.

EVOLUTION is the Extraction of Roots, and is performed by the Division of the Indices. Thus the Cube Root of a or a^1 , by dividing the Index of a by 3, may be represented thus, $a^{\frac{1}{3}}$. In like Manner the Square Root of $a+x$ will be represented by $\sqrt{a+x}^{\frac{1}{2}}$, and that of $a+\sqrt{xy}+b$ by $a+\sqrt{xy+b}^{\frac{1}{2}}$. Moreover, the Square Root of aa will be represented by a . And of $aa+2ab+bb$, by $a+b$. In short, Evolution is nothing but the Converse of what has been said above in this Section.

QUESTIONS to be resolved by ALGEBRA.

TO resolve any Question by Algebraic Signs we ought first to be perfectly acquainted with the Nature and State of the Question, and then to express it afterwards by one or more Equations, according to the different Circumstances contained in the Question. This done, we must disengage the unknown Quantities, which may be done by Addition, Subtraction, Multiplication and Division of one or several Quantities. But instead of Addition or Subtraction

166 QUESTIONS in ALGEBRA.

fraction, the Terms may be transposed from one Side of the Equation to the other, observing to change the Signs of the Quantity transposed. Lastly, we may substitute disengaged Quantities in the Room of those unknown which are equal thereto. But these Things will be best understood by Examples.

It is proposed to find a Number, which being added to 19 will make 107. This easy Question is designed only to shew the Manner of proceeding in these Cases. Let x be the unknown Quantity, to which 19 must be added thus, $x + 19$. This will make the first Number or Side of the Equation. And as this Sum ought to be equal to 107, the Number given, we shall have 107 for the other Number or Side of the Equation. Then the Question may be expressed in this Manner, $x + 19 = 107$.

To resolve this Equation we are to discover the Value of x ; and to effect this we must contrive to leave it by itself on one Side of the Equation; but we must remember to change the Signs of the Quantities to be transposed. Thus the Equation above may be changed into this, $x = 107 - 19$. Therefore we must take 19 from 107, and the Remainder will be 88, the Value of x . This Process is founded upon this Maxim, *If you take away Equal Quantities from Equal Quantities, the Remainder will be equal.*

Suppose a Number is to be found, from which 107 being subtracted, the Remainder will be 19, x is the Number sought; then $x - 107 = 19$, and by Transposition of the -107 to the other Side of the Equation, which makes it $+107$, the Equation will stand thus, $x = 19 + 107$. If therefore you add 19 to 107 the Sum will be 126 the Number sought.

To find a Number which being subtracted from 127 the Remainder will be 89. Let x be the Number sought, and then $127 - x = 89$. Here x is a negative Quantity, but transpose it to the other Side and it will become positive, thus $127 = 89 + x$; then transpose 89 to the other Side of the Equation, and it will be $127 - 89 = x$; then take 89 from 127, and the Remainder will be 38, the Number sought; so that $x = 38$, x is equal to 38.

To find a Number, which being trippled and subtracted from 29, and also when the Number sought is subtracted from 15 the first Remainder shall be equal to the second. Let x be the Num-

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QUESTIONS in ALGEBRA. 167

Number sought, then $3x$ will be its tripple, which being subtracted from 29, the Number given, the Remainder will stand thus, $29 - x$; to find the second Remainder, x is to be taken from 15, which will be $15 - x$, which is supposed to be equal to the first Remainder, and then the Equation will stand thus, $29 - 3x = 15 - x$, for this was the Condition of the Question.

To resolve this Question, we must observe, that x , the Number sought, should not be suffered to remain on both Sides of the Equation; and therefore we must bring it by itself on the one or other Side, so that we may transpose $-3x$ to the other Side, which will make it $+3x$, and the Number 15 must be transposed to the same Side $3x$ was taken from, and then the Equation will stand thus, $29 - 15 = 3x - x$: therefore take 15 from 29, and $-x$ from $3x$, and the Equation will then be $14 = 2x$, which being divided by 2 it will be $x = 7$, which is the Number sought: for if you tripple 7 it will make 21, which being subtracted from 29 there will remain 8; and if 7 is subtracted from 15 there will remain 8, which are the Conditions of the Question.

Another Method of resolving Equations, is to *disengage an unknown Quantity*. When an unknown Quantity is preceded by a Number, we must put the Number under the Number or Quantity on the other Side of the Equation; which will make a kind of Fraction equal to the disengaged Quantity; therefore if we were to find a Number which being multiplied by 5 is equal to 79, let x be the Number sought, which being multiplied by 5 will produce $5x = 79$. Now to disengage x you must take the 5 away from the x and place it under the 79 thus, $x = \frac{79}{5}$; then divide 79 by 5, and the Quotient will be $15\frac{4}{5}$ or 15.8.

To find a Number which being divided by 17.5, the Quotient will be 19.75. Let x be the Number that is to be divided by 17.5, then $\frac{x}{17.5}$ will be equal to 19.75

thus $\frac{x}{17.5} = 19.75$; then transpose 17.5, and it will stand

thus, $x = 19.75 \times 17.5$; multiply these two Numbers together and the Product will be 345.625 or $345\frac{5}{8}$. I shall now proceed to give you several Problems in Order, with their Resolutions, which being carefully observed, you will soon gain a competent Knowledge in this Art.

168 QUESTIONS in ALGEBRA.

I. What two Numbers are those whose Difference is 14 and Sum 36? *Solution.* Let the two unknown Numbers be x and y ; then it will stand thus,

$$x - y = 14$$

$$x + y = 36$$

add these Equations together and you will have $2x = 14 + 36 = 50$, therefore x will be $=$ to 25, which being substracted from 36, leaves 11, which is y , for 11 taken from 25 leaves 14, and added to 25 makes 36.

II. Three Persons, A , B , and C , make a Contribution, which in the whole amounts to 76 l .: of this A contributes a Sum unknown; B contributes as much as A , and 10 l . more; and C contributes as much as A and B together. I demand their several Contributions. *Solution.* The Contribution of A call x , B $x + 10$, C $2x + 10$; therefore these added together make $4x + 20 = 76$, and $4x = 76 - 20 = 56$; then $x = \frac{56}{4} = 14$. Hence it appears that A contributed 14, B 24, and C 38.

III. Three Persons, A , B , and C , together contribute 276 l . of which A contributes a Sum unknown, B twice as much, and 12 l . more, and C thrice as much as B and 12 l . more; then the Equation will stand thus.

$$A \ x, \ B \ 2x + 12, \ C \ 6x + 48 = 9x + 60 = 276$$

$$9x + 60 = 276$$

$$9x = 276 - 60$$

$$9x = 216$$

$$x = 24$$

$$A's \ Share \ x = 24$$

$$B's \ 2x + 12 = 60$$

$$C's \ 6x + 12 = 192$$

$$Sum \ 276$$

IV. A Man has six Sons, each four Years older than his next younger Brother, and the eldest is three times as old as the youngest. I demand their several Ages. *Solution.* The Age of the youngest is x , of the next $x + 4$, of the next $x + 8$, of the next $x + 12$, of the next $x + 16$, of the next $x + 20 = 3x$. Then

$$x + 20 = 3x$$

$$20 = 3x - x = 2x$$

$$10 = x$$

Therefore the Age of the younger is 10, the second 14, the third 18, the fourth 22, the fifth 26, and the sixth 30.

V. Two Persons, A and B , talking of their Money, says A to B , if you will give me two of your Guineas we shall have as many as each other. On the contrary, says B to A , if you will give me two Guineas, I shall have twice as many as you. How many had each before they met? *The*

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QUESTIONS in ALGEBRA. 169

Question is answered by *Substitution*; and one Quantity is substituted instead of another, by multiplying that which is to be introduced by the Number which multiplies the Quantity which is vanished; and by taking the Product of this Multiplication in the Room of that vanishing Quantity, as will appear in this and the following Questions. We have $x+2=y-2$, consequently $x=y-4$.

We have likewise $y+2=2x-4$, consequently $y+6=2x$. Therefore to cause x to vanish, multiply $x=y-4$ by 2, and you will have $2x=2y-8$. Take away the $2x$ in both Equations, and you will have $y+6=2y-8$. Therefore $y+14=2y$, therefore y must be equal to 14, and because x is equal to $y-4$, x must be equal to 10.

VI. Says *A* to *B*, if you will give me twice as many Shillings as you have in your Pocket, with my own I shall have 100; or if to your Shillings I add three times as many of my own, you will also have 100 Shillings. How many had *A* and *B* severally?

$$\begin{aligned} x+2y &= 100 & x &= 100-2y \\ y+3x &= 100 & y &= 100-3x \\ 3x &= 100-y \\ 3x &= 300-6y \\ 100-y &= 300-6y \\ 100 &= 300-5y \\ 5y+100 &= 300 \\ y+20 &= 60 \\ y &= 40 \\ x &= 20 \end{aligned}$$

VII. What two Numbers are those that when multiplied together the Product will be 144; and the Quotient of the greater divided by the less is 16? Let the greater of the two Numbers sought be x , and the less y ; these when multiplied together will make $xy=144$, and the Quotient of the greater divided by the less will be $\frac{x}{y}=16$.

If $xy=144$, then x will be $\frac{144}{y}$

If $\frac{x}{y}=16$, then x will be equal to $16y$.

Consequently $16y = \frac{144}{y}$, and $16yy=144$, $yy=9$, $y=3$, for if you divide 144 by 16, the Quotient will be 9 equal to the Value of yy , the Root of which is $y=3$.

Note, this Question is a Degree higher than the former.

170 QUESTIONS in ALGEBRA.

VIII. It is required to find two Numbers with the following Properties, *viz.* that the first, with half the second, may make 20, and that the second, with one third Part of the first, may make 20. *Solution.* Let the Numbers sought

$$\begin{array}{lcl} \text{be } x \text{ and } y. & \text{Then } x + \frac{y}{2} = 20 & y + \frac{x}{3} = 20 \\ & 2x + y = 40 & 3y + x = 60 \\ & 2x = 40 - y & x = 60 - 3y \\ & \frac{40 - y}{2} = x & \frac{40 - y}{2} = 60 - 3y \end{array}$$

$$\begin{array}{l} 40 - y = 120 - 6y \\ 5y = 120 - 40 \\ 5y = 80 \\ y = 16 \\ x = 12 \end{array}$$

IX. A Jockey has two Horses *A* and *B*, whose Values are sought. He has also two Saddles, the one valued at 12*l.* the other at 2*l.* When he sets the best Saddle upon *A* and the worst upon *B*, *A* will then be worth twice as much as *B*. But if he sets the best Saddle upon *B*, and the worst upon *A*; than *B* will be three times more valuable than *A*. The Price of the two Horses is required. Let the Price of each be *x* and *y*. Their Prices as first described will be $x + 12$ and $y + 2$; after the Manner last described $y + 12$ and $x + 2$: and then the first Equation will stand thus,

$$\begin{array}{lcl} x + 12 = 2y + 4 & \text{The Second Equation} & y + 12 = 3x + 6 \\ x + 12 - 4 = 2y & & y + 12 - 6 = 3x \\ x + 8 = 2y & & \frac{y + 6}{3} = x \\ x = 2y - 8 & & 3 \end{array}$$

Therefore

$$\begin{array}{lcl} \text{A's Price } 4 + 12 = 16 & \} & 4 + 2 = 6 \\ \text{B's Price } 6 + 2 = 8 & \} & 6 + 12 = 18 \end{array}$$

$$2y - 8 = \frac{y + 6}{3}$$

$$\begin{array}{l} 6y - 24 = y + 6 \\ 5y = 24 + 6 \\ 5y = 30 \\ y = 6 \\ x = 4 \end{array}$$

X. A Man laid out 30 Pence in Apples and Pears. He bought the Apples at 4 and the Pears at 5 a Penny. Afterwards he let his Neighbour have half his Apples and one third of his Pears for 13 Pence at the same Rate he bought them. What was the Number of each Sort?

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QUESTIONS in ALGEBRA. 171

Let the Number of Apples be x and the Pears y . Then the Apples will be $\frac{x}{4}$, and the Pears $\frac{y}{5}$. Then the first Equation will stand thus.

$$\frac{x}{4} + \frac{y}{5} = 30$$

$$x + \frac{4y}{5} = 120$$

$$5x + 4y = 600$$

$$x = \frac{600 - 4y}{5}$$

$$\frac{600 - 4y}{5} = \frac{1560 - 8y}{15}$$

$$600 - 4y = \frac{7800 - 40y}{15}$$

$$9000 - 60y = 7800 - 40y$$

$$20y = 9000 - 7800$$

$$y = 60 \text{ the Number of Pears.}$$

$$x = 72 \text{ the Number of Apples.}$$

The Price of half the Apples is $\frac{x}{8}$ produced by multiplying the Denominator by 2. And the Price of the Pears is $\frac{y}{15}$ produced by multiplying the Denominator by 3. Hence arises the second Equation.

$$\frac{x}{8} + \frac{y}{15} = 13$$

$$x + \frac{8y}{15} = 104$$

$$15x + 8y = 1560$$

$$x = \frac{1560 - 8y}{15}$$

One third of the Pears being 20 came to 4*d.* at 5 a Penny; and one half the Apples being 36, came to 9*d.* at 4 a Penny.

XI. A Greyhound seeing a Hare at the Distance of 60 of his own Leaps, pursues her at full Speed, making 3 for every 4 of the Hare's, and passing over as much Ground

* See the second Equation, wherein x is found to be $\frac{1560 - 8y}{15}$

172 QUESTIONS in ALGEBRA.

in 2 Leaps as the Hare did in three. I demand how many Leaps each made during the whole Course? Let the Number of the Dog's Leaps during the whole Course be x , of the Hare's in the same Time y . Hence will arise this Proportion.

$$\begin{array}{l} x : y :: 3 : 4 \\ 4x = 3y \\ x = \frac{3y}{4} \end{array} \quad \begin{array}{l} x - 50 : y :: 2 : 3 \\ 3x - 150 = 2y \\ x = \frac{2y + 150}{3} \end{array}$$

$$\begin{array}{l} \text{Then } \frac{3y}{4} = \frac{2y + 150}{3} \\ 3y = \frac{8y + 600}{3} \\ 9y = 8y + 600 \\ y = 600 \\ x = 450 \end{array}$$

XII. A certain Company at a Tavern found when they came to pay their Reckoning, that had there been three Persons more in Company to pay the same Bill, they should not have paid so much by a Shilling apiece; and that had there been two Persons less, they would have paid one Shilling apiece more. I demand the Number of Persons? Let the Number of Persons be x , and each Man's particular Reckoning y . The Number of Shillings that each Man would have paid on the first Supposition will be

$$\begin{array}{l} \frac{xy}{x+3} = y-1 \\ xy = xy - x + 3y + 3 \\ x = 3y - 3 \end{array}$$

On the second Supposition. $\frac{xy}{x-2} = y+1$

$$\begin{array}{l} xy = 2y + 2 - 2y - 2 \\ x = 2y + 2 \end{array}$$

$$\begin{array}{l} \text{Then } 3y - 3 = 2y + 2 \\ y = 5. \text{ The Number of Shillings.} \\ x = 12. \text{ The Number of Persons.} \end{array}$$

XIII. A Company of Men, Women and Children spent at a Feast 2000 Pence among them; each Man spent 100 Pence, each Woman 20 Pence, each Child 5 Pence. I demand the Number of Men, Women and Children? This is an indeterminate Question, that is, such a one as may receive many Answers, since there is nothing to determine

QUESTIONS in ALGEBRA. 173

mine the Value of x if put for the Number of Persons; because we are at Liberty to suppose the indeterminat^e Quantity x what we please.

XIV. Two Persons A and B were talking of their Ages, says A to B , "7 Years ago I was thrice as old as you at that Time; and 7 Years hence I shall be just twice as old as you will be. I demand their present Ages? Let their present Ages be x and y . Their Ages 7 Years ago were $x-7$ and $y-7$, and 7 Years hence they will be $x+7$ and $y+7$.

$$\text{Then } x-7=3y-21$$

$$x=3y-14$$

$$\text{Again } x+7=2y+14$$

$$x=2y+7$$

$$\text{Then } 3y-14=2y+7$$

$$y=21$$

$$x=49$$

XV. Three Persons A , B and C , were talking of their Money; says A to B and C , give me half your Money and I shall have 17 Guineas; says B to A and C , give me a third Part of yours and I shall have 17 Guineas; says C to A and B , give me a fourth of yours and I shall have 17 Guineas. I demand how many Guineas each of them had? Let A 's Money be x , B 's y , and C 's z . And then

$$x+\frac{y+z}{2}=17 \text{ and also } y+\frac{x+z}{3}=17 \text{ and } z+\frac{x+y}{4}=17$$

$$2x+y+z=34$$

$$3y+x+z=51$$

$$4z+x+y=68$$

$$\frac{34-y-z}{2}=x$$

$$51-3y-z=x$$

$$68-4z-y=x$$

$$\frac{34-y-z}{2}=51-3y-z$$

$$51-3y-z=68-4z-y$$

$$34-y-z=102-6y-2z$$

$$68-51=3z+2y$$

$$5y=102-34-z$$

$$3z-17=2y$$

$$y=\frac{68-z}{5}$$

$$\frac{3z-17}{2}=y$$

$$\frac{68-z}{5}=\frac{3z-17}{2}$$

$$68-z=15z-85$$

$$136-2z=15z-85$$

$$136+85=5z+2z$$

$$172=22z$$

$$z=13$$

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174 Of the Nature and Use of Logarithms.

The Value of x being found, the rest are readily found by the former Equations. Whence it will appear that A had 5 Guineas, B 11, and C 13; for if B and C give half of their Guineas, that is 12, A will have 17. If A and C give one third of theirs, namely 6, B will have 17. If A and B give one fourth of theirs, viz. 4, then C will have 17.

XVI. What two Numbers are those whose Sum is twice, and Product 12 times their Difference? Let the greater Number be x , the less y . Then their Difference will be $x-y$, their Sum $x+y=2x-2y$. Their Product,

$$yx=12x-12y$$

$$yx+12y=12x$$

$$12y=12x-yx$$

$$x=\frac{12y}{12-y}$$

$$x+y=2x-2y$$

$$x+y+2y=2x$$

$$x+3y=x$$

$$x=3y$$

$$3y=\frac{12y}{12-y}$$

$$36y-3yy=12y$$

$$3yy=36y-12y$$

$$3y=24$$

$$y=8 \quad x=3y=24$$

Difference 16. Sum 32. Product 192.



Of LOGARITHMS, CHORDS, SINES, TANGENTS, and SECANTS.

Logarithms are numbers invented for the more easy and ready Performance of arithmetical Calculations; they are printed in the Form of Tables, of which the common Sort contain the Logarithms of Absolute Numbers from 1 to 10,000; but *Sherwin's* Tables have a series of Numbers from 1 to 100,000, and by an easy Method the Logarithm of all Numbers, from 100,000, to 10,000,000 may be readily found. The best Tables for *Sines* and *Tangents* are *Vlack's*, or rather *Gardiner's*, which are an Improvement of the former. They contain the Logarithms of the natural *Sines* and *Tangents* to every 10 Seconds, by which they may be readily found to every Second; the same may be done by *Sherwin's* Tables for *Sines*, *Tangents*, and *Secants*, with

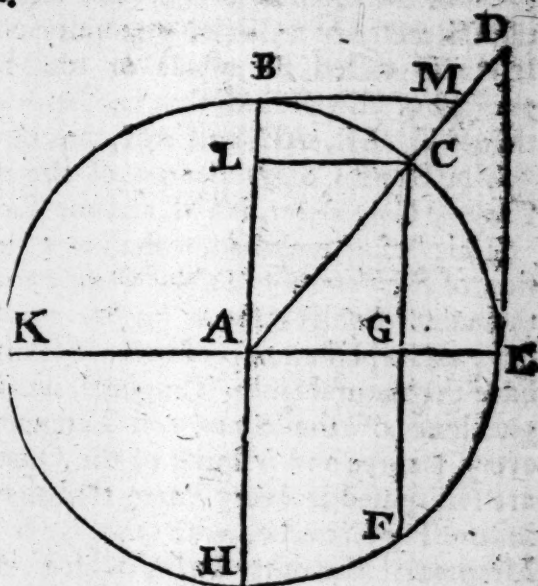
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with somewhat more Difficulty. But I forget that I am speaking of Things the Reader is yet supposed to be ignorant of, and therefore I shall explain them by Means of the following Diagram.

A CHORD, or Subtense, is a right Line drawn in a Circle from one Part of the Circumference to the other; thus CF is the Chord of the Arches CEF, and CKF, also BH being the Diameter of the Circle, is the Chord of the Semicircles BEH, and BKH. Half of this Diameter is the Radius.



The SINE, or, as some call it, the *right Sine* of an Arch, is half the Chord of twice that Arch; thus CG is half the Chord of CF, and is consequently the Sine of the Arch CE, as also of the Arch CBK, which Arch CE, is the half of CEF; hence it appears that the right Sine of an Arch less than a Quadrant, is the right Sine of an Arch as much greater than a Quadrant.

The Difference of any Arch from a Quadrant is called its *Complement*; thus BC is the Complement of CE. The Difference of any Arch from a Semicircle is called the *Supplement*, thus CBK is the Supplement of EC.

The *VERSED SINE* of an Arch is that Part of the Diameter which lies between the right Sine of that Arch, and the Circumference. Thus GE is the Versed Sine of the Arch EC, and GK the versed Sine of the Arch CBK.

The *TANGENT* of an Arch is a right Line drawn from one of the Extremities of this Arch perpendicularly to the Diameter of this Arch, and terminated by meeting with another Line drawn from the Centre by the other Extremity of the same Arch; thus ED is the Tangent of the Arch EC.

The *SECANT* of an Arch is a right Line drawn from the Centre through the other Extremity of the Arch, and terminates

176 *Of the Nature and Use of Logarithms.*

terminates the Tangent. Thus the Secant of the Arch EC is AD.

The WHOLE SINE, or the *Radius*, is the Sine of 90 Degrees or the Quarter of a Circle, and is always equal to half the Diameter of a Circle, generally called the Semidiameter. It is also called the whole or total Sine, because it is the greatest of all the Sines that can be drawn in the same Circle; thus AK, AB, AE and AH, are all total Sines.

The SINE COMPLEMENT of the Arch EC is LC; the Tangent Complement, is BM, and the Secant Complement is AM.

This being premised, I shall now proceed to the Explanation of the common Tables so easy to be met with in Mathematical Books; for as for *Sherwin's* and *Gardiner's* they have an Explanation prefixed. Some of these small Tables have the natural Sines, Tangents, and Secants, with the Logarithms of the Sines and Tangents only. These are to every Degree and Minute of the Quadrant of a Circle; and are so disposed in every Page, that the Degrees and Minutes in one Page, make, with the correspondent Degrees and Minutes of the other Page, which respects the former, exactly 90 Degrees; thus the one is a Complement to the other, which is very useful in Practice, wherein we have almost always Need of the Complement of one Arch or Angle or another, which is to be found in the other Page opposite to the Degrees and Minutes of your Arch, without the Trouble of subtracting it from 90 Degrees.

Every Page contains half a Degree, or thirty Minutes, which is placed on the left Side of the Tables, and the Degrees at the Top, with their Sines, Tangents, and Secants to a Radius of 10,000,000 Parts, 100,000 of which will serve for small Computations, such as those of practical Geometry generally are; and therefore to save Trouble, the two last Figures towards the Right-hand are commonly separated by a Dot.

As for the Logarithms of the Sines and Tangents, they are to a much greater Radius, viz. 10,000,000,000, which makes it plain, that in working by Logarithms the greatest Calculations are not only much more easy, but more exact.

The Second Table contains the Logarithms of natural Numbers from 1 to 10,000, which is sufficient for common Calculations in Practical Geometry. However, there is a Method of enlarging them to 10,000,000 without any sensible Error, which I shall explain hereafter.

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Of the Nature and Use of Logarithms. 177

I. *To multiply two whole Numbers together which are less than 10,000.* Seek in the Table of Logarithms the two Numbers proposed, and add the Logarithms of them together; the Sum will be the Logarithm of the Product of two given Numbers which must be sought for in the Table, and will be found under 4,0000000; thus if you add 144 and 64 together, whose Logarithms are 2.1583625, and 1.8061800, when these are added together they will make 3.9645425, to which the Number 9216 belongs, which is the Product of the Numbers given.

But it often happens that the Sum of the two Logarithms is greater than 4,0000000, in which Case, as it will not be found in the Table, I shall shew how it may be found in the Sequel.

II. *To divide a Number less than 10,000 by another.* Seek in the Table of Logarithms the two Numbers proposed, and from the Logarithm of the Dividend take that of the Divisor, and the Remainder will be the Logarithm of the Quotient. Suppose we were to divide 9216 by 64, the Logarithm of the former is 3.9645425, and of the latter 1.8061800; then the Remainder will be 2.1583625. But Subtraction may be avoided by taking the Arithmetical Complement of the Divisor to 10. Thus the Arithmetical Complement of 1.8061800, is 8.1938200, these added together will make the same Sum, after taking away the first Figure from the Left-hand thus, 3.9645425

Comp. Arith. 8.1938200

12.1583625

Thus you see taking away the first 1 to the Left-hand, the Numbers turn out exactly the same.

III. *To find the Square Root of a Number given less than 10,000.* If you take half the Sum of the Logarithm of the given Number, you will have the Logarithm of the Root sought. Suppose you want to know the Square Root of 9216, whose Logarithm is 3.9645425. Half of this Logarithm is 1.9822712, to which answers 96 for the Root of the Number proposed.

IV. *To find the Cube Root of a Number less than 10,000.* Take one third of the Logarithm of the proposed Number, and you will have the Logarithm of the Root sought. To find the Cube Root of the Number 9261, whose Logarithm is

178 *Of the Nature and Use of Logarithms.*

is 3.9666579; the third of which is 1.3222193; to which answers 21, the Cube Root of the given Number.

V. *To find the Logarithm of a whole Number greater than 10,000, and less than 10,000,000.* Suppose 3567894, the Logarithm of which is too great to be found in the said Tables. Cut off 894, the three Figures on the Right-hand, that the Remainder 3567 may be found in the Table, and its Logarithm 3.5523031; more Figures might have been cut off, but then the Remainder would have been too small, and besides the Difference of the Logarithms at the Beginning of the Tables are more unequal, which might occasion some Degree of an Error; therefore that the Error may be inconsiderable, as few Figures must be cut off as possible.

In making use therefore of Logarithms, 3.5523031 belonging to 3567, which may be supposed to signify 3567000, which is a thousand Times greater than 3567, on Account of the proposed Number 3567894, from which 894 was taken; you must add then the Logarithm of 1000, which is, 3.000000 to the above Logarithm; which may as well be done by only adding the Characteristic 3 for the three Figures cut off 894, and you will have 6.5523031 for the Logarithm of 3567000, which is less than that of the Number proposed 3567894. To know how much it is less, take the Logarithm 3.5523031 from the Logarithm 3.5524248 which immediately follows, and the Remainder will be 1217, the Difference of the two Logarithms; which is likewise the Difference of the Logarithms of the Numbers 3567000 and 3568000, the Difference of which is 1000. Then say by the Rule of Three, If 1000, the Difference between 3567000, and 3568000 gives 1217, what will 894 give? The Answer will be 1087, which must consequently be added to the Logarithm 6.5523031, and you will have 6.5524118, the Logarithm sought.

VI. *To find the Number answering to a Logarithm when it is not to be found in the Table.* Suppose the given Logarithm was 6.5524118, the Logarithm next less than that, neglecting the first Figure, is 3.5523031; the Number answering to this is 3567; this subtracted from the given Logarithm will leave the Remainder 1087, which augmented with three Cyphers, will be 1087000; divide this by 1217; the Difference between the Logarithm found, and

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Of the Nature and Use of Logarithms. 179

and the next following, and the Quotient will be 894, which if placed to the right of 3567, you will have 3567894; thus you see this Rule is only the Reverse of the former.

VII. *Of the Index and Characteristic of Logarithms.* This is the first Figure or Figures towards the Left-hand distinguished from the rest by a Point or Dot. It shews the Number of Places the absolute Number consists of more than Units, agreeing to any Logarithm; thus the Index of the Logarithm of every Number less than 10 is 0; above 10, and less than 100, 1; above 100, and less than 1000, 2; above 1000, and less than 10,000, 3; above 10,000 and less than 100,000, 4, and so on; insomuch that by the Index of the Logarithm, you may know of how many Places the absolute Number consists.

VIII. *To find the Logarithm of a proper Fraction, and a Decimal Fraction.* The first is done by subtracting the Logarithm of the Numerator, from the Logarithm of the Denominator. Suppose the Fraction was $\frac{3}{4}$.

0.6020599 the Log. of 4

0.4771212 the Log. of 3.

—————
—0.1249387 the Log. of $\frac{3}{4}$.

Note, The Logarithm of a proper Fraction is always negative, and should have the Sign (—) prefixed; it has a different Use from the Logarithms of whole Numbers, for in Multiplication it must be subtracted, and in Division be added to the Logarithm of a whole Number. For a *Decimal Fraction*: Seek the Decimal of it in the same Manner as if it were a whole Number, before which set an Index consisting of one more than the Number of Cyphers prefixed to the Decimal. Let the Decimal given be .00593. The Logarithm of 593 is .7730547. Now as the Decimal has two Cyphers prefixed, the Index or Characteristic must be 3; but like the proper Fraction, it is a Negative, and must be written thus—3.7730547.

IX. *To find the Logarithm of an improper Fraction, and of a whole Number and a Decimal.* An improper Fraction consists of a whole Number and a Fraction, which must be reduced to an improper Fraction as before taught. Let the Number be $1\frac{2}{3}$, which reduced into an improper Fraction will be $\frac{5}{3}$.

Then

180 *Of the Nature and Use of Logarithms.*

Then substract the Logarithm of the Denominator from that of the Numerator.

Log. of the Numerator 40.	1.6020600
Log. of Denominator 3.	0.4771212

Log. of $13\frac{1}{3}$	1.1249388
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With regard to Decimals, let the Logarithms of the following to be desired, 3.567.35.67.356.7; the Logarithm .5523031 will be the same for all; the Difference will be only in the Index thus, 0.5523031, 1.5523031, 2.5523031, and so of any other Number.

X. *To find the absolute Number belonging to a Logarithm.* When the given Logarithm is less than 4.0000000, which is the Logarithm of 10000, it may always be found in the Table, or at least that which is near it. The absolute Number is always placed on the left Side of the Logarithm thus found; but to find the Number more accurately when the Logarithm found does not answer exactly to the Logarithm given, you must proceed as follows. Let the Logarithm be 3.9531250, the nearest Number in the Table which is less is 3.9530828, which directs to the absolute Number 8976 and somewhat more, which must be a Fraction. Take the Logarithm found in the Table, from the Logarithm given, and the Remainder will be 422. Substract also the Logarithm found from the Logarithm immediately following, and the Difference is 484. Then say, by the Rule of Three, If 484 : 100 :: 422, the Answer will be 87, which is a Decimal Fraction; therefore the Logarithm 3.9531250 to which the absolute Number is 8976.87, or, which is the same Thing, you need only add Cyphers to the Number to be divided, and the Answer will be exactly the same, for it only saves the Trouble of stating the Question. If the Logarithm is greater than can be found in the Table, as for instance, 4.5524118, the nearest it in the Table, neglecting the first Figure that is less, is 3.5523031, and the Number answering thereto is 3567, which are the four first Figures of the Number sought. Substract the Logarithm given from the Logarithm found, and the Difference will be 1087; add three Cyphers to this Number, and it will make 1087000; divide this by 1217, the Difference between the Logarithm found and the next immediately following, and the Quotient will be 894; which placed to the Right of the former Figures, will make 3567894. But because

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Of the Nature and Use of Logarithms. 181

the Index of the Logarithm is 4, the two last Figures are a Decimal Fraction 35678.94.

XI. *To find the Difference between two given Square Numbers.* Now because the Difference between two Square Numbers is equal to the Product of the Sum and Difference of their Roots; it will thence follow, that if you add the Logarithms of this Sum and the Difference, you will have the Difference between the Square Numbers proposed. Let the Square Numbers be 65536, and 20736, whose Roots are 256, and 144; the Sum of the Roots will be 400, and the Difference 112, whose Logarithms are 2.6020600, and 2.0492180, the Sum of these two is 4.6512780, which is the Logarithm of the Difference of the two given Squares.

Note, When the Square Numbers are given, you need only to subtract the greater from the lesser to know their Difference. By this Method you may readily know the Difference between Square Numbers when the Root only is given.

XII. *To find a Mean Proportional between two Numbers given.* Add the Logarithms of the Numbers together, and the half of the Sum shall be the Logarithm of the Mean Proportional required. Let a Mean Proportional between 454 and 4086 be required.

2.6570559	Log. of 454
3.6112983	Log. of 4086

6.2683542	Sum
3.1341771	the half; the Log. of 1362,
	the Number required.

R

PRACTICAL

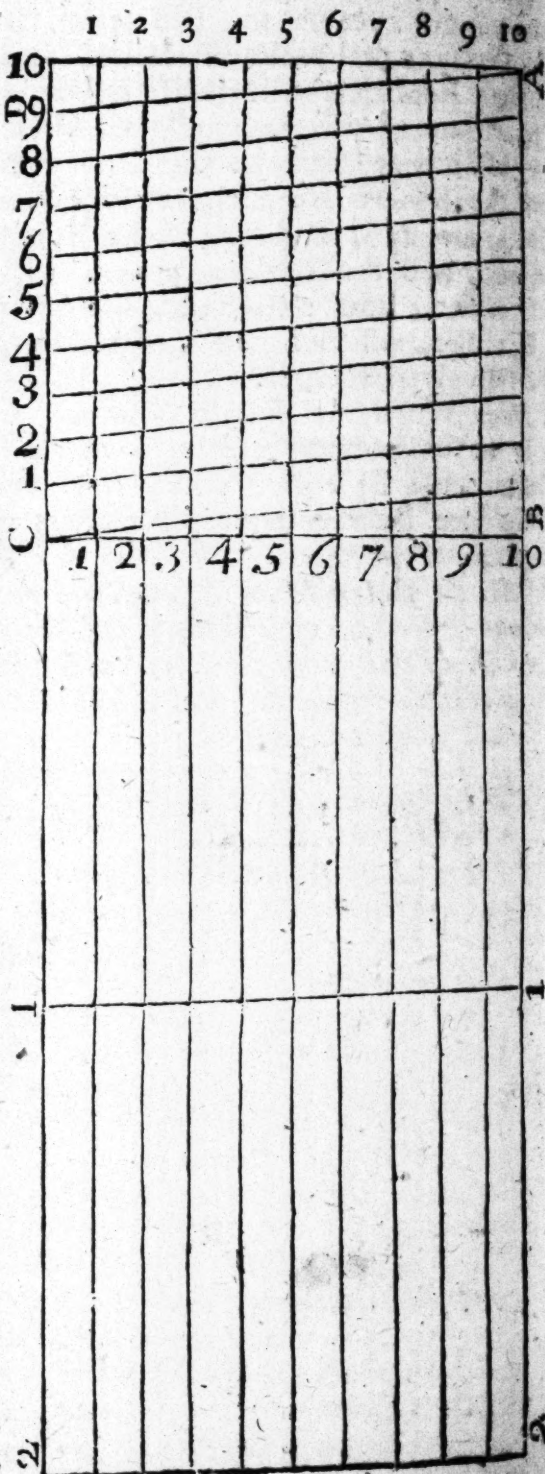
182 PRACTICAL GEOMETRY.

PRACTICAL GEOMETRY.

Of making a SCALE and a LINE of CHORDS.

BEfore we proceed to Practice, it is necessary to take Notice, that the Learner should be provided with Compasses, Scales, Sectors, or other Instruments proper for the dividing Lines, and the Circumference of a Circle; otherwise these Operations will be very tedious and the Labour endless; those who live near large Towns where Mathematical Instruments are sold, may easily provide themselves with all Things necessary; but as there are some who live in Places where these Things are procured with Difficulty, I shall shew how that Defect may be supplied by their own Labour.

You may make a Parallelogram or oblong Square of any Size you please, as in the Figure annexed. At the End of which mark off a Part exactly square,



PRACTICAL GEOMETRY. 183

and divide each Side into ten equal Parts, drawing Diagonal Lines from one Side to the other, as you see done in the Figure; and likewise draw Parallel Lines through the Whole of the Parallelogram at the same Distances; afterwards take one Side of the Square in your Compasses, as from A to B, and set it off from B to 1, from 1 to 2, &c. till you come to 9, which will be a proper Length for your Ruler; and by this Means you may take off any Number of equal Parts under a Thousand, with the utmost Exactness.

There are various Methods of making a Line of Chords, but the most accurate and exact is by the Help of the following Table, which contains the Distance of every Degree in the whole Quadrant. Or you may take off the Distances in the above Scale without making any Line of Chords at all. However, because this Line is the readiest for Use, I have given an Example conformable to the Table in the following Figure.

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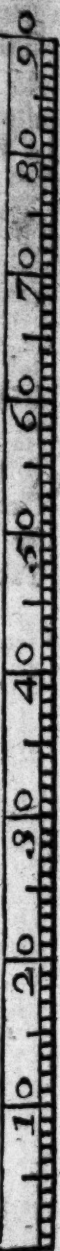
A TABLE

A TABLE serving to divide a Line
of CHORDS.

Deg.	Cho.	Deg.	Cho.	Deg.	Cho.
1	017	31	534	61	1015
2	035	32	551	62	1030
3	052	33	568	63	1045
4	070	34	585	64	1060
5	087	35	601	65	1074
6	105	36	618	66	1089
7	122	37	635	67	1104
8	139	38	651	68	1118
9	157	39	668	69	1132
10	174	40	684	70	1147
11	192	41	700	71	1161
12	209	42	717	72	1176
13	226	43	733	73	1190
14	244	44	749	74	1204
15	261	45	765	75	1217
16	278	46	781	76	1231
17	296	47	797	77	1245
18	313	48	813	78	1259
19	330	49	829	79	1273
20	347	50	845	80	1286
21	364	51	861	81	1299
22	382	52	876	82	1312
23	398	53	892	83	1325
24	416	54	908	84	1338
25	432	55	923	85	1351
26	450	56	939	86	1364
27	466	57	954	87	1377
28	484	58	970	88	1389
29	501	59	984	89	1402
30	518	60	1000	90	1414

A Line of CHORDS.

Chords



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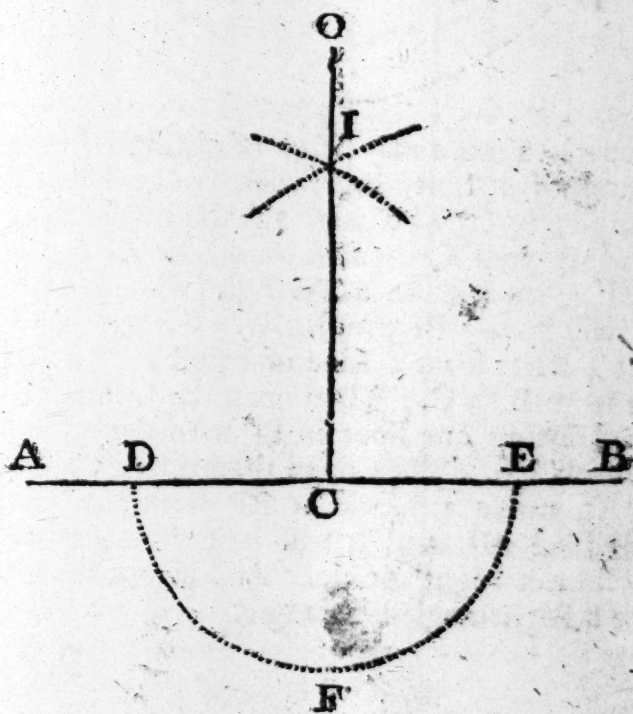
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PRACTICAL GEOMETRY. 185

Of drawing LINES and PLAIN FIGURES.

I. To raise a Perpendicular from a Point given in a straight Line.

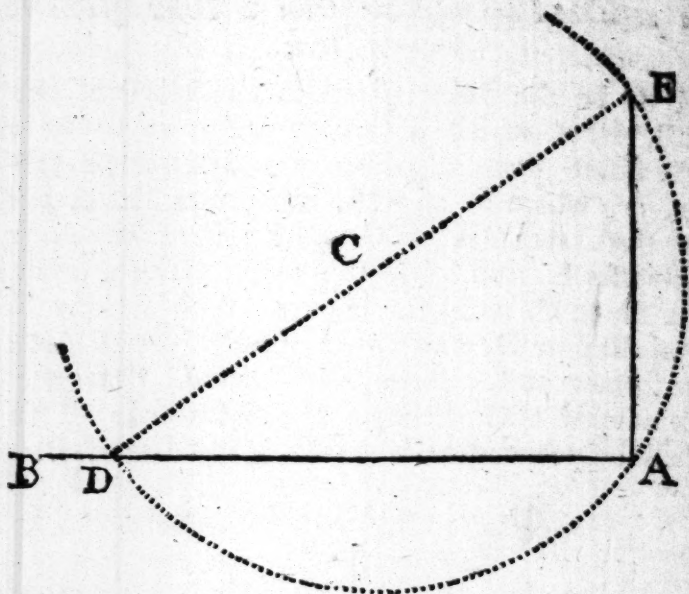
LET C be the Point given in the Midst of the Line AB, from which a Perpendicular is to be raised. From the Point given C, draw the Semi-circle DFE at Pleasure, or, which is as well, make two Marks with the Point of the Compasses in D and E; then set one Foot of the Compasses in E, and with the other make a small Arch over the Point C, as in the Figure; then set one Foot of the Compasses in D, and make another small Arch crossing the former at I. From the Point C draw the right Line demanded CO through the Section I. This Line CO shall be perpendicular to the given Line AB.



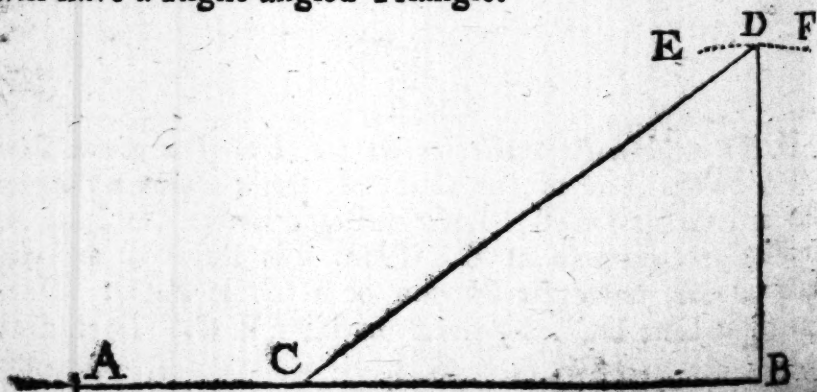
II. To raise a Perpendicular at the End of a given Line. Let A be the End of the Line AB, upon which a Perpendicular is to be raised. Set the Point above the Line AB at Pleasure, suppose at C. From this Point C and the Interval CA, draw the Portion of a Circle EAD. Draw the right Line DCE by the Points D and C. Then draw the

186 PRACTICAL GEOMETRY.

the Line required AE, and it shall be Perpendicular to AB, and to the End of the given Line.



But there is a more easy Way of raising a Perpendicular at the End of a Line, or, which is the same Thing, a Right Angle, by the Help of the Numbers 3, 4, and 5. That is, open your Compasses on a Line of equal Parts to 3, 4, and 5, and make a Triangle with these Numbers, and you will have a Perpendicular. Suppose the Line was AB, take 4 Parts from a Line of equal Parts, and set that Distance from B to C. Then open the Compasses to three Parts, and setting one Foot in B, with the other make the obscure Arch EF. Then open them to 5, and setting one Foot in C, make a Mark in EF with the other at D. Draw the Line BD, and it will be the Perpendicular, and CBD will be a Right Angle. And if you draw CD, and will have a Right-angled Triangle.

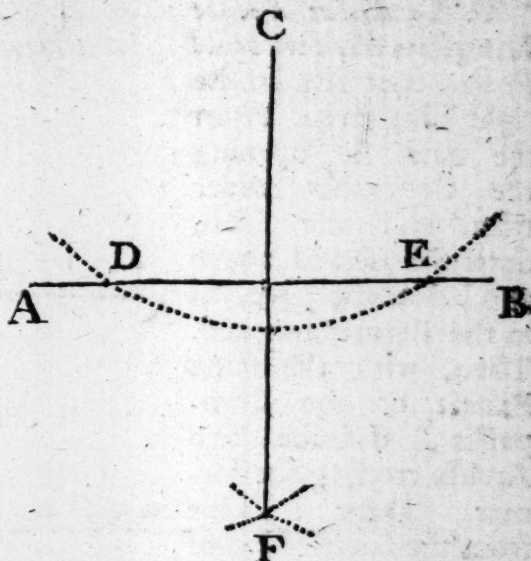


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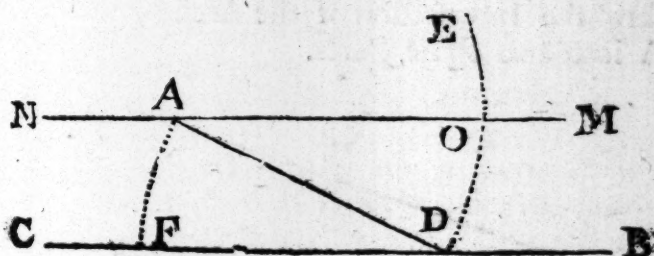
C

III. To let fall a Perpendicular upon a right Line given, from any Point without the same. Let C be the Point given, from which we are to let fall a Perpendicular upon the Line AB. From the Point C draw the Arch DE, at Pleasure, cutting the Line AB at the Points D and E. From the Points D and E make the Section F



below the Line. Draw the Line CF, which will be the Line demanded.

IV. To draw a Line that shall be parallel to another right Line at a given Distance. Let A be the Point, thro' which a Line is to be drawn Parallel to the Line CB. Draw the oblique Line AD at Pleasure. From the Point A draw the Arch DE; and from the Point D, draw the Arch AF. Then make the Arch DO equal to the Arch AF, and draw the Line required NM, by the Points A and O.



188 PRACTICAL GEOMETRY.

V. *To divide a right Line given into two equal Parts.* Let AB be the

right Line given. From the End A, opening the Compasses wider than half the Line,

draw the Arches above and below the Line, as in the Figure annexed.

Then, with the same Extent of the Compasses, describe two Arches crossing the former.

Draw a Line from the Intersection of the two Arches above the Line, to the Intersection of the

two Arches below the Line, and it will divide the Line AB into two equal Parts.

VI. *To divide a given right-lined Angle into two equal Parts.* Let ABC be the Angle given. Set one Foot of the

Compasses in the Angular Point B, and extend them to any convenient Distance to draw the Arch DE, with

the same or any other Extent above half the Distance, set one Foot in D and draw the Arch F.

Then keeping the Compasses at the same Extent, set one Foot in E and intersect the Arch F. A Line drawn from the Angular

Point, thro' the Intersection of the Arches, will divide the Angle A into two equal Parts.

VII. *Angle.* ABC be the Angle given. Set one Foot of the

Compasses in the Angular Point B, and extend them to any convenient Distance to draw the Arch DE, with

the same or any other Extent above half the Distance, set one Foot in D and draw the Arch F.

Then keeping the Compasses at the same Extent, set one Foot in E and intersect the Arch F. A Line drawn from the Angular

Point, thro' the Intersection of the Arches, will divide the Angle A into two equal Parts.

VIII. *Angle.* ABC be the Angle given. Set one Foot of the

Compasses in the Angular Point B, and extend them to any convenient Distance to draw the Arch DE, with

the same or any other Extent above half the Distance, set one Foot in D and draw the Arch F.

Then keeping the Compasses at the same Extent, set one Foot in E and intersect the Arch F. A Line drawn from the Angular

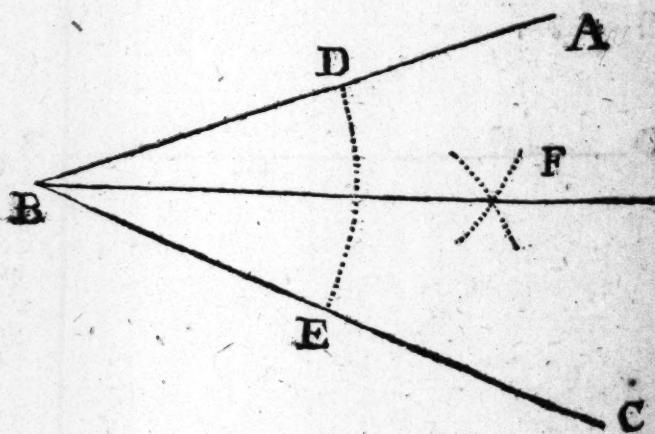
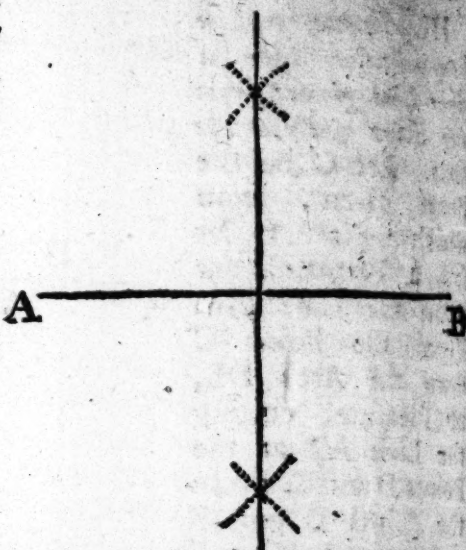
Point, thro' the Intersection of the Arches, will divide the Angle A into two equal Parts.

VIII. *Angle.* ABC be the Angle given. Set one Foot of the

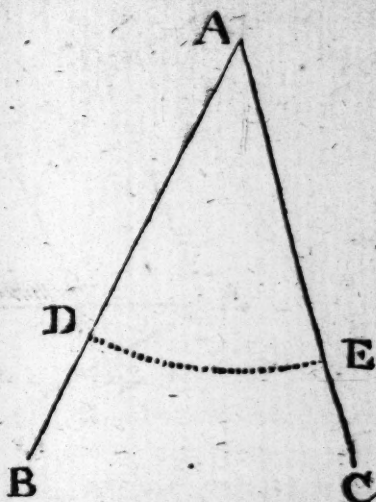
Compasses in the Angular Point B, and extend them to any convenient Distance to draw the Arch DE, with

the same or any other Extent above half the Distance, set one Foot in D and draw the Arch F.

Then keeping the Compasses at the same Extent, set one Foot in E and intersect the Arch F. A Line drawn from the Angular



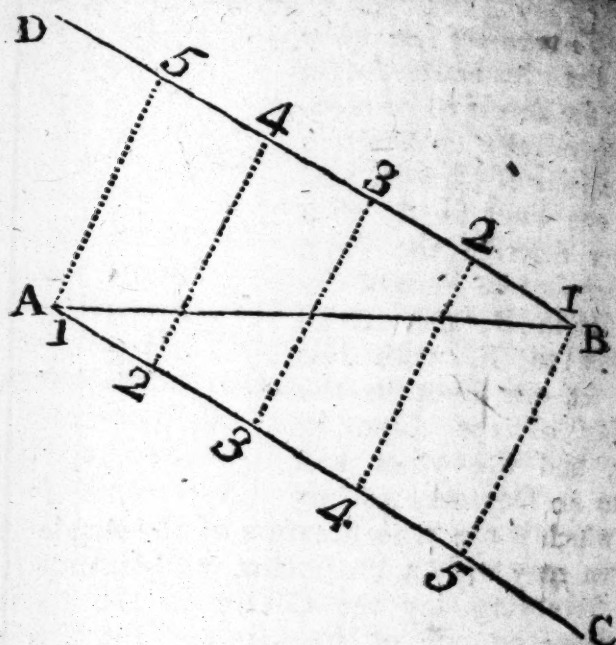
VII. *To measure an acute Angle.* Let the acute Angle ABC be the Angle to be measured; then take 60 Degrees from the Line of Chords, and setting one Foot in A, with the other describe the Arch DE; then set one Foot of the Compasses in D, and extend the other to E, with this Extent set one Foot in the Beginning of the Line of Chords, and the other will reach to 40 Degrees, 45 Minutes, which is the true Measure of the Angle ABC.



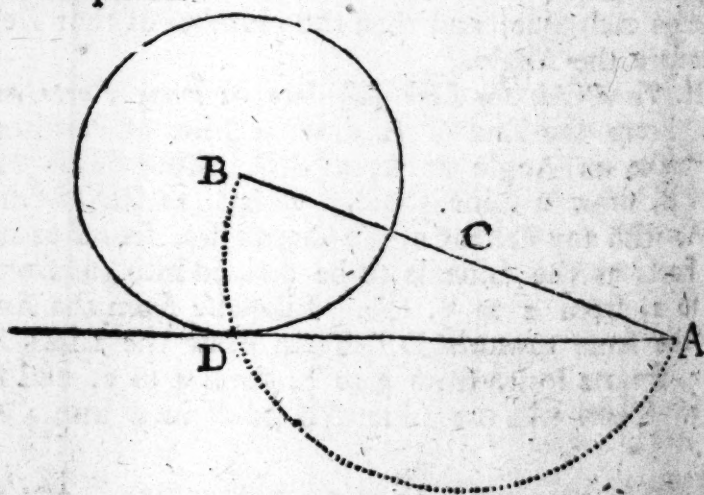
Or you may with a Protractor, an Instrument of great Use in Surveying, lay the Centre on the Point A, and its Diameter on one of the Lines of the Angle, and on the Number of Degrees intercepted between the two Sides, shall be the Measure of the Angle given. When this Instrument is not at hand, you may make Use of a Sector by making AD or AE the Radius, and then you must take the Distance between D and A in your Compasses, and opening the Sector till one Point of the Compasses, being placed upon 60 of the Line of Chords, shall reach to 60 on the other Side of the Sector in the same Line. This done, let the Sector remain at this Opening, and then take the Distance between D and E in your Compasses, and place them on the same Lines with the same Degree on each Side, and then the Number of that Degree will declare the Angle.

VIII. *To divide the Line AB into as many Parts as you please.* From the End of A draw a Line at Pleasure, so as to make an Angle at A, as AC. Likewise from the End of B, draw a Line parallel to AC, as BD. On the Line A, with any Extent of the Compasses, set off as many equal Parts as the Line is to be divided into, as from A, or 1 to 2, from 2 to 3, &c. Likewise from the End of B do the same towards D. Then draw the Lines from 1 to 5, from 2 to 4, from 3 to 3, from 4 to 2, and from 5 to 1. Then will the Line AB be divided into 4 equal Parts.

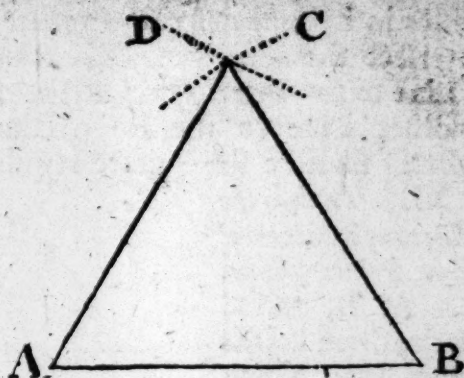
IX. *From*



IX. From the Point A out of a Circle to draw a Tangent to a Circle, or a Line that shall touch the Circumference without intersecting it. From the Point A draw a Line to the Centre B of the Circle, which Line is called the Secant. Divide this Line in two equal Parts in C. Then with one Foot of the Compasses in the Point C, and with the Extent CA or CB, draw the Semi-Circle ADB, cutting the Circumference in D. Then from the Point given A, draw a Line through the Intersection at D. This Line shall be the Tangent, or the Line touching the Circle required.



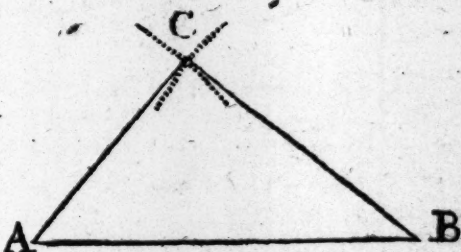
X. To draw an equilateral Triangle, whose Sides shall be equal to a given Line. Let the Line be AB, which take in your Compasses, and setting one point of the Compasses at A, make an Arch of a Circle at C; then set one point of the Compasses at B, and make another Arch



of a Circle intersecting the former. From the Intersection of these Arches draw Lines to A and B, and the Triangle will be completed, having all Sides equal to AB.

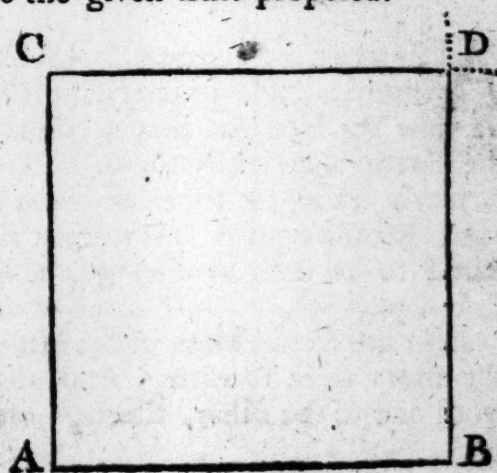
XI. To draw a Triangle whose Sides shall be equal to three given right Lines, provided the shortest two when join'd together are longer than the third.

Let A, B, and C be the Lines given. Draw the Line AB equal to C. Then take in your Compasses, and setting one Foot in A,



make an Arch at C, with the other End. This done, take A in the same Manner, and setting one Foot in A, intersect the former Arch at C with another Arch. Lastly draw the Lines AC and BC to the Intersection of the Arches respectively, and the Triangle will be completed, having three Sides, each equal to the given Line proposed.

XII. To draw a Square whose Sides shall be equal to a right Line given. Let AB be the right Line given. Then erect a perpendicular upon the point A of equal Length to AB. Then take the Length AB in your Compasses, and setting one Foot in C describe an Arch at D; likewise set one Foot of the Com-

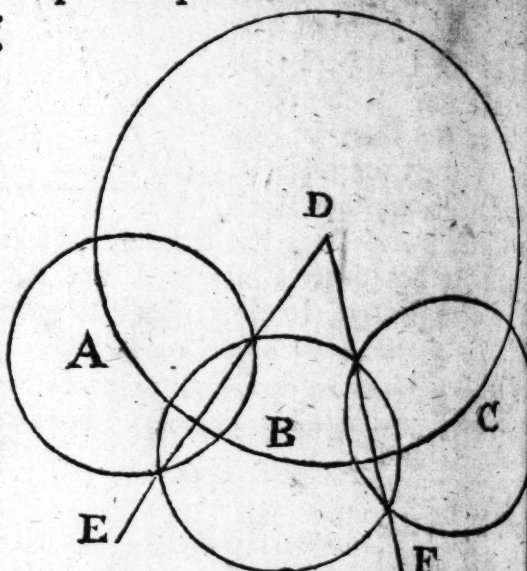


192 Of the Globe, Fixed Stars, &c.

passes in B, and describe another Arch at AD, which shall intersect the former. This done, from the Point C draw a Line to the Intersection at D, and from the Point B draw another Line to the Intersection at D. And the Square ABCD shall be the Square required.

XIII. To describe a Circumference thro' three Points given.

Let A, B, and C be the three Points given, thro' which the Circumference of a Circle is to be drawn. On the Point A describe a Circle, and likewise with the same Opening of the Compasses, on the other Points B and C intersecting each other, as you see in the Figure.



Draw the Lines ED and FD through the Intersections of the Circles, and where they meet, as at D, place one Foot of the Compasses, and with the other reaching to A, or B, or C, describe the Circumference required.



Of the CIRCLES of the SPHERE or GLOBE, and of the fixed Stars, Planets and Comets.

A SPHERE or GLOBE is in Shape like a round Ball and is made to represent the World; because when we view the Heavens they appear to be round, and because the Earth is certainly so, or at least very near it. It was formerly thought to resemble a Lemon, but after very exact Measurements, in various Parts of the World, it was found to be like an Orange, a little flattened towards the Poles.

Poles are fixed Points in the Heavens, round about which the Stars seem to turn. And an imaginary Line passing from one to the other, through the Centre of the Earth,

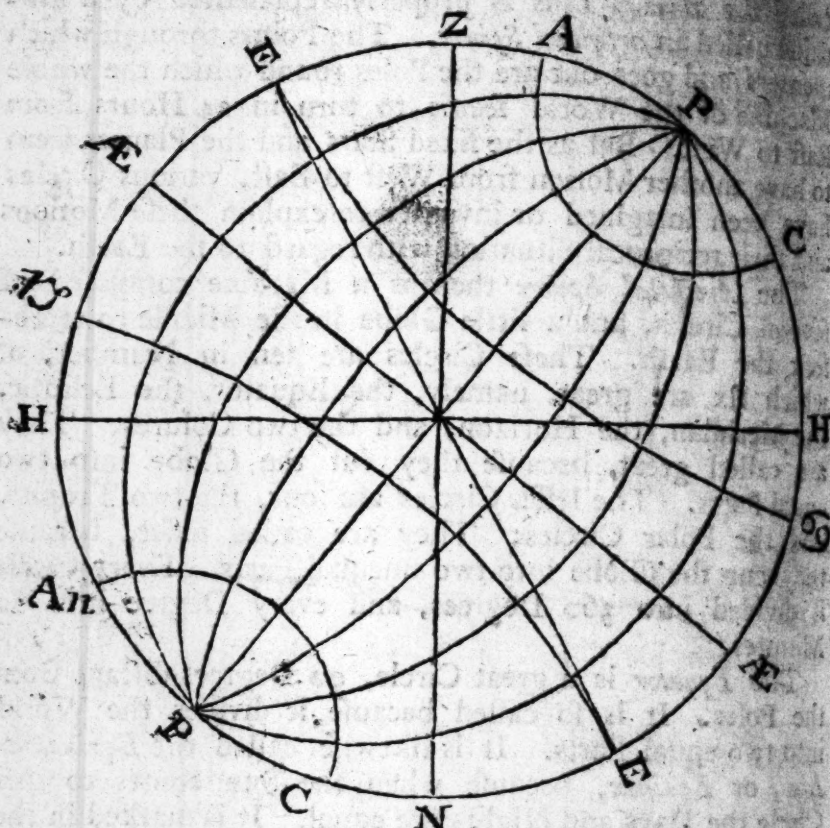
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called the *Axis*. This is properly represented by a Machine called an *artificial Sphere*. The Points through which it enters and goes out are the Poles round which the whole Machine of the World seems to turn in 24 Hours from East to West. But as the fixed Stars and the Planets seem to have another Motion from West to East, various Circles have been imagined or invented to explain these Motions and their reciprocal Situation with regard to the Earth.

The *Artificial Sphere* then is a Machine composed of several Circles, and a little Globe in the Middle to represent the Earth. These Circles are ten in Number, of which six are great, namely, the Equator, the Ecliptic, the Meridian, the Horizon, and the two Colures. They are called great, because they cut the Globe into two equal Parts. The lesser Circles are four, the two Tropics, and the Polar Circles. They are called lesser, because they cut the Globe into two unequal Parts. Every Circle is divided into 360 Degrees, and every Degree into 60 Minutes.

The *Equator* is a great Circle, 90 Degrees distant from the Poles. It is so called because it divides the World into two equal Parts. It is likewise called the *Equinoctial Line*, or *Equinox*, because when the Sun comes to this Circle the Days and Nights are equal. It is marked in the annexed Diagram with *ÆÆ*. The Uses of it are to divide the World into two equal Parts; that which has the Artic Pole is called the North, and that which has the Antarctic Pole is called the South. It likewise cuts the Ecliptic in two Points, which are the Points of the Equinoxes, that is, when the Sun comes thereto, the Days and Nights are equal in all Places, except at the Poles, for at one of those Places a Day of six Months begins, and at the other a Night of six Months.

The



The *Ecliptic* is a Circle, which is placed obliquely in the Sphere, and is so called because the Eclipses happen therein. The Sun makes his annual Progress through this Circle, and is never found out of it.

The *Zodiac* incircles the Sphere like a Belt, and lies on each Side of the Ecliptic to the Extent of 16 Degrees. The Equator divides the Zodiac into two equal Parts; the one North, the other South. They contain the *Twelve Signs or Constellations*. The Northern Half contains *Aries* ♈, *Taurus* ♉, *Gemini* ♊, *Cancer* ♋, *Leo* ♌, *Virgo* ♍; and the Southern *Libra* ♎, *Scorpio* ♏, *Sagittarius* ♐, *Capricornus* ♑, *Aquarius* ♒, *Pisces* ♓. The Ecliptic is distinguished by EE.

The *Meridian* is a great Circle which passes through the Poles of the World, and those of the Horizon, that is, the Zenith and the Nadir. The Sun is upon it every Day at Noon or Twelve o'Clock. It is possible to travel from Pole to Pole under the same Meridian; but if you go

never

never so little East or West you must necessarily change it. It serves to divide the World into two Parts, that on the Side whereon the Stars-rise is called the *East*, and that whereon they set is called the *West*. It serves to shew the Middle of the Day and Night, and the Elevation of the Pole. It is the outward Circle in this Figure.

The *Horizon* is of two Kinds, the visible or sensible, and the rational. The rational Horizon is a great Circle concentric with the Earth. Its Poles are the Zenith and Nadir of the Place where we inhabit. The Zenith Z is the Point directly over our Heads, and the Nadir is the Point opposite thereto under our Feet. It divides the Sphere into two equal Parts called *Hemispheres*; the one of which is called the *superior* and *visible*, the other *inferior* and *invisible*.

Besides the rational Horizon there is one visible and sensible, which bounds our View when we are in the open Field. The Uses of the Horizon are to divide the World into the upper and lower Hemispheres, whence it follows, when it is Day in one, it is Night in the other. It shews the Rising and Setting of the Stars, the Length of Day and Night, the Break of Day and Twilight. For when the Sun is 18 Degrees below it, the Twilight begins in a Morning, and ends when the Sun begins to rise. It serves to shew the Height of the Pole, because it is nothing else but the Arch or Portion, which is comprehended between the Pole of the World and the Horizon. It likewise points out the four Cardinal Points of the World; for the Places where the Meridian and Horizon cut each other, are called North and South; and the Places where the Horizon and Equator cut each other, are termed the East and West. It is marked HH.

The Sphere may be placed in three Manners with regard to the Horizon, whence come the Distinctions of a *right*, *oblique* and a *parallel Sphere*.

The Sphere is right when the Poles of the World are placed in the Horizon, and when the Zenith and Nadir are in the Equator. In this Position of the Sphere, the Circles described by the Sun in his diurnal Motion are cut by the Horizon in two equal Parts. People that live in a right Sphere, are said to live under the Line, and the Sun is directly over their Heads twice a Year. There are Places in *Africa*, the *East-Indies* and *America*, directly under

der the Line, that are well inhabited, and the Days and Nights are equal throughout the Year. Here all the Stars of both Hemispheres may be seen in different Parts of the Year.

A *parallel Sphere* has the Equator parallel to the Horizon, and the Poles of the World are the Zenith and Nadir. In this Case half the Ecliptic is above the Horizon, and the other half below. Those that live there, if any such, have one half of the Year Day, and the other half Night. Besides, they have a Twilight which continues four Months. They can never see but one half of the Heavens.

An *oblique Sphere* is that which has an oblique Horizon. In this Position all the Circles of the Sphere are cut unequally by the Horizon except the Equator. All the People in the World, except those that live under the Equator and the Poles, have this Position. The Days and Nights are always unequal, except at the Time of the Equinoxes. This Increase of the Days, as well as of Twilight, becomes more sensible the nearer we approach to the Poles.

The *two Colures* are two great Circles, which cut each other at Right Angles at the Poles of the World; that is, they make an Angle of 90 Degrees. The one is called the *Equinoxial Colure*, and the other the *Solstitial Colure*. The former passes through the very Beginning of *Aries* and *Libra*; and the other through the very Beginning of *Cancer* and *Capricorn*.

The *Tropics* are two of the lesser Circles, and they are distant from the Equator 58° Degrees, and 46 Minutes. The Tropic of Cancer is towards the North, and that of Capricorn towards the South. They are marked *E_{cc}*, and *E_{lf}*. When the Sun comes to the Tropic of Cancer, he makes the longest Day in all the Year with us, and the shortest Day with those that live on the other Side of the Line, or in the Southern Hemisphere. When he comes to the Tropic of Capricorn, he makes the shortest Day with us, and the longest on the other Side of the Line.

The *Polar* or the *Arctic* and *Antarctic Circles*, are described at the Distance of 23 Degrees and 29 Minutes from the Poles of the World, and pass through the Poles of the Ecliptic. The one is North AC, the other South AnC.

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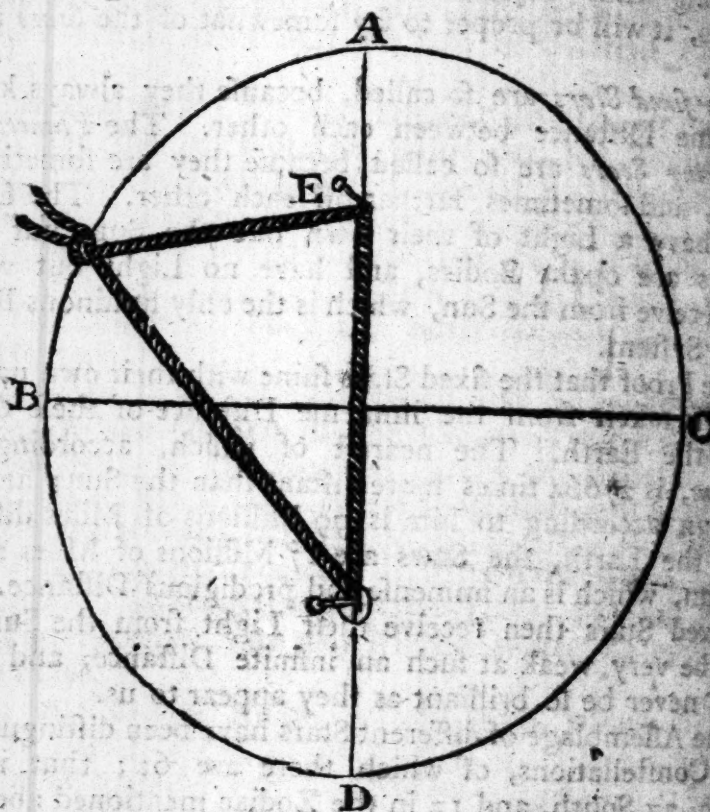
Having thus explained the different Circles of the Spheres, it will be proper to say somewhat of the *Stars* and *Planets*.

The *fixed Stars* are so called, because they always keep the same Distance between each other. The *Planets* or *wandering Stars* are so called because they are sometimes nearer, and sometimes farther off each other. The fixed Stars have a Light of their own like the Sun, but the Planets are opaque Bodies, and have no Light but what they receive from the Sun, which is the only luminous Body in our System.

The Proof that the fixed Stars shine with their own native Light is taken from the immense Distance of these Stars from the Earth. The nearest of which, according to *Huygens*, is 27664 times more distant than the Sun; and as the Sun according to him is 99 Millions of Miles distant from the Earth, the Stars are 27 Millions of Miles from the Sun, which is an immense and prodigious Distance. If the fixed Stars then receive their Light from the Sun, it must be very weak at such an infinite Distance, and they could never be so brilliant as they appear to us.

The Assemblage of different Stars have been distinguished into Constellations, of which there are 62; that is 23 North, 27 South, and 12 in the Zodiac mentioned above.

There are seven Planets *Saturn* ♄, *Jupiter* ♃, *Mars* ♂, *Sol* ☉ or the Sun, *Venus* ♀, *Mercury* ☿, and the Moon or *Luna* ☾. The Planets always keep within the Zodiac, and the Circles they move in have not the same Centre as the Earth, or more properly speaking, they move in an *Ellipsis* by some improperly called an Oval. We have hitherto, in Compliance with the vulgar Opinion, and for the more easy Explanation of the Subject, talked of the Motion of the Sun; whereas in reality the Sun stands still, and all the Planets move about the Sun, except the Moon, which moves about the Earth as a Centre. It is observable likewise that the Earth itself is a Planet, and moves round the ☉ like the rest of the Planets in an elliptical Orbit. In the annex'd Figure, which is an *Ellipsis*, AP is the transverse Diameter, BC is the conjugate Diameter, and F and ☉ are called the Focus's of the Ellipsis. It is made by fixing two strong Pins, one in the Point F, and the other in the Point ☉, and with a double Thread with a Knot at the End, as in the Figure. The Length of the double Thread must



be a little more than that of the Distance of the Pins, and must be more or less according to the Kind of Ellipsis to be described. Then a Pencil must be put between the Thread, next the Knot, and with an even Hand it must be moved about the Focus's circularly, and then a Curve Line will be described, called an Ellipsis. If the Pins are removed a little nearer each other, the Length of the Thread remaining the same, you will have another Ellipsis, but of a different Kind from the former. If you remove them still nearer, you will have another Kind approaching still nearer to a Circle; and if the Pins are placed close together, you will have an entire Circle. This being premised, I affirm that the Sun is placed at $\odot$ one of the Focus's, and the Earth moves in the outward Line of the Figure, through which it passes in the Space of a Year. When the Earth comes to D it is nearest the $\odot$, as it is evident to the Sight, and is called the *Perihelion*. This happens in *December* every Year, at which Time it has the quickest

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Planets and Comets.

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Motion. When the Earth comes to A it is farthest from the Sun, and is in the *Aphelion*, at which time it moves the slowest.

The *Sun* and the *Moon*, for we must now speak according to the common Apprehension, are the Planets which concern us most. And among all the Planets the Sun alone, as was said before, shines with its own native Light. Its Motion is not so irregular as that of the rest. It passes through the *Ecliptic* without ever deviating from it. The Circle that it describes by its daily Motion is parallel to the Equator. The *Apogee* of the Sun, that is, when he is at the greatest Distance from the Earth, is in the seventh Degree of Cancer, and his *Perigree*, or when nearest the Earth, is seven Degrees of Capricorn. Whence it follows, that he continues seven Days longer in the North Part of the World, than in the South.

Some may wonder that when the Sun is nearer the Earth by some Millions of Miles than in the Summer Time, the Cold should then be the greatest in all Parts of *Europe*. But we must observe, that at this Time the Sun rises but to a small Height above the Horizon, and consequently the Rays fall very obliquely on the Spot which we inhabit. Besides, it continues but a short Time above the Horizon.

The Sun moves about a Degree every Day from the West to the East by his own proper Motion, whence he runs thro' 360 Degrees in 365 Days, 5 Hours, and 48 Minutes, for which Reason every fourth Year is *Bissestile* or *Leap Year*, and contains 366 Days. But as this contains more than it ought, in process of Time it became 11 Days too forward, which is the Reason of the late Change of the *Stile* to bring it back to its original Institution.

Tho' the *Moon* appears to be the largest of all the Planets, except the Sun, it is the smallest of them all, and the Occasion of its seeming so large is, because it is near the Earth; for the greatest Distance is no more than 31 Diameters of the Earth, and the least Distance is only 27. Now as the Diameter of the Earth, is 6890 Geographical Miles of 60 to a Degree, this Number multiplied by 31 or 27, will shew the greatest and least Distance of the Moon from the Earth in Geometrical Miles.

The *Moon* is an opaque Body, and has no other Light than what it receives from the Sun. The different Manners

ners in which it is placed, with regard to the Sun, is called its *Phases*; which are principally four, the new and full Moon and the Quarters; the new Moon, is when the Moon is in Conjunction with the Sun. For it being then placed between the Earth and the Sun, that Side which is enlightened is turned toward the Sun, and consequently it cannot shine upon us. But as she gets at a Distance from the Sun, one Part is enlightened which turns towards us, which increasing daily, at length attains the first Quarter, when half its Disk or Face is illuminated; then as it gets farther and farther, its Light increases till it comes to the Middle of the Circle, when the Moon is in Opposition of the Sun; then the whole enlightened Part is turned towards us, and we call it the full Moon. As it approaches nearer the Sun the light Part grows less, and when it comes to three Parts of its Revolution, then it is in its last Quarter. The Difference between the first and the last Quarter consists in this; that at the first Quarter the brightest Part is toward the East, and at the last Quarter towards the West.

The Revolution of the Moon is performed in 27 Days and about 8 Hours; but because the Sun, during this Time, makes a Progress of 27 Degrees, it cannot overtake the Sun under two Days more. Whence it happens that from one Conjunction to another, there must be at least 29 Days. The Lunar Year is composed of 12 of these Conjunctions, whence the Months consist of 29 and 30 Days alternately; all which together make 354 Days, which is eleven Days less than the solar Year.

The proper Motion of the Moon is performed in a Circle, which cuts the Ecliptic in two Points, which are called *Nodes*. The Distance of this Circle from the Ecliptic in the Place where it is greatest, is 5 Degrees 18 Minutes; and as the Nodes do not always cut the Ecliptic in the same Place, but have a retrograde Motion, the Sun cannot be eclipsed every new Moon, nor the Moon itself when at full, for Eclipses only happen when the Sun is in or near the Nodes; at which Time if it is in the Opposition so circumstantiated, the Earth gets between the Moon and the Sun, then the Moon is eclipsed; and at the new Moon, if the Moon gets between the Sun and us, it eclipses the Sun. When the Moon is eclipsed it is deprived of Light, and appears the same wherever it is visible.

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In order to comprehend more readily this Declination of the Moon's Orbit, you may put two Hoops of a Barrel one within the other, and let them be about four Fingers distant in two Places; one of the Hoops will represent the Ecliptic, or Path of the Sun, and the other, the Orbit, or Path of the Moon; and the Places where they cross each other will represent the Nodes which are called the Head and Tail of the Dragon. These Nodes are not fixed as was before observed, but sometimes cut the Ecliptic in one Place, and sometimes in another.

The other Planets, that is Saturn, Jupiter, Mars, Venus, and Mercury, generally move from the West towards the East, by their own proper Motions, describing the Circles which cut the Ecliptic in two Places like the Moon.

Saturn performs his Revolution round the Sun in 29 Years and 155 Days; *Jupiter* in eleven Years, 313 Days; *Mars* in one Year, and 321 Days; *Venus* in 224 Days, eighteen Hours; and *Mercury* in 88 Days.

The Diameter of the Sun, is 100 Diameters of the Earth, and is a Million of Times larger than the Earth. The Diameter of *Saturn* is somewhat less than ten Times the Diameter of the Earth, and is 980 Times larger than the Globe of the Earth; it is sometimes distant from the Sun 221870 Semidiameters of the Earth, and never less than 197802. The Diameter of *Jupiter* is a little more than 10 Diameters of the Earth; its 1170 Times larger than the Earth, and is 110000 Semidiameters of the Earth distant from the Sun. *Mars* is three-fifths of the Diameter of the Earth; and is equal to a fifth Part of the Globe of the Earth; its greatest Distance from the Sun is 36630 Semidiameters of the Earth, and the least Distance 30426. *Venus* has a Diameter equal to that of the Earth, and is of the same Size; its greatest Distance from the Sun is 16016 Semidiameters of the Earth, and its least Distance 15796. The Diameter of *Mercury* is one third of the Diameter of the Earth, and its Bulk equal to a twenty-seventh Part of the Bulk of the Earth; its greatest Distance from the Sun is 10274 Semidiameters of the Earth, and its least 6754. The Diameter of the *Moon* is a little more than one-fourth of the Diameter of the Earth, and is equal to a fiftieth

fiftieth Part of the Globe of the Earth ; its greatest Distance from the Earth is 62 of its Semidiameters, and its least 54. The Diameter of the Earth is 6890 geographical Miles, and its Semidiameter 3445 of the same Miles. Hence the Distances and Diameters of all the Planets may be readily found in Miles, using the Diameters or Semidiameters, as above-mentioned, and multiplying the one by the other.

Having thus given an Account of the Magnitudes and Distances of the Planets it will not be amiss to give a more philosophical Account of them, in such a Manner that the young Inquirer may be enabled to talk a little rationally about them.

The Sun is an immense Body formed of celestial Fire, or of Matter more like Fire than any thing we yet know ; but though it is immense, with regard to us, yet it takes up but a Point of that infinite Place wherein it is placed ; we cannot say the Space it takes up is either the Centre or the Extremity of this Space ; for to talk properly of the Centre and the Extremity, it must have a Figure and Bounds. Every fixed Star is like a Sun which, probably, belongs to another World.

While the Sun turns about its own Axis in twenty-five Days and a half, the Matter of which it is formed escapes on all Sides, and is extended to the greatest Distances ; not only to us, but far beyond us. This Matter is that of which Light consists, and has such a prodigious Rapidity that it reaches us in half a quarter of an Hour. It is reflected when it falls upon Bodies which it cannot penetrate. By which Means we know that the Bodies of the Planets are opaque, because they send it back to us ; for when the Sun is hid from us in the other Hemisphere, we are then able to perceive this glimmering Light.

There are six Planets that receive their Light from the Sun, viz. *Mercury, Venus, the Earth, Mars, Jupiter, and Saturn*. Each describes a large Orbit round the Sun, and being placed at different Distances, make their Revolutions round about him at different Times, as has been already mentioned. There is one Thing remarkable in these Revolutions, that they are all made the same Way, which caused some Philosophers to imagine they were all carried about by a Vortex or Kind of a Whirlpool. But the Absurdity of this Opinion is now generally known.

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Several Planets as they make a Progress in their own Orbits, turn about on their own Axis at the same Time, perhaps they have all a like Motion; but we are not sure of any more than the Earth, which takes up 24 Hours; of *Mars*, who performs it in 25; and of *Jupiter*, who turns about his Axis in 10 Hours. As for *Venus*, though the best Astronomers allow this Planet to have a Revolution, which is confirmed by the various Faces that appear to us, yet they are not agreed about the Time, some affirming it to be 23 Hours, and others 24.

The Moon is not a Planet of the first Rank, because it does not make its Orbit immediately about the Sun, but about the Earth. These Sort of Planets are called *Secondary* or *Satellites*; and as the Earth has one, *Jupiter* has four, and *Saturn* five.

The Laws of the Planets Motion is a late Discovery, and it appears that as they move about the Sun there must be an attractive Force which keeps them in their Orbits, otherwise they would fly off in a right Line. All Bodies belonging to our System like the Planets describe an Ellipsis, in one of whose Focus's the Sun must necessarily be placed, and then this Focus must be so much nearer the Extremity of the Ellipsis in proportion as it is lengthen'd; hence it comes to pass that when the Planet is in a certain Part of its Orbit, called the *Perihelion*, it must be much nearer the Sun; and when it is in another, called the *Aphelion*, it must be at a greater Distance from the Sun. As for the Planets just mentioned, their Differences are not very considerable, because their Orbits are pretty near circular.

Thus COMETS, which have of late been allowed to be Planets, are subject to the same Laws as the other six; but they describe Ellipses which are not only long, but of all Degrees of Length. The Sun placed in the Focus of the Ellipses of the Planets, is likewise in the Focus of the Ellipses of the Comets; and their Motion is regulated by the same Laws as the rest; but as the Sun is very near one of their Extremities, the Distance of the Comets from the Sun are very different in the different Parts of their Orbits. Some, as that in 1680, have been so near in their *Perihelion* as to be no farther from the Sun than a sixth Part of its Diameter, and when they have been so near they fly off to an immense Distance, and move on to make their Progress beyond the Region of Saturn.

Comets

Comets take up much more time in performing their Revolutions round the Sun than the Planets, for the slowest of the Planets does not take up thirty Years, and the quickest of the Comets is at least seventy-five Years in coming to the same Place again, and some are several Ages in performing their Revolutions.

The Length of their Orbits, and the Slowness of their Revolutions, is the Reason that the Returns of most are not certain. As for the Planets, they never get out of Sight, whereas the Comets make their Appearance only during a small Part of their Course, which they run in the Neighbourhood of the Earth; they perform the rest in the highest Regions of the Heavens, during which Time they are lost to us, and when one appears again, we are not sure it is the same, but by searching after the Courses of the Comets of former Times, if there are any such supported by proper Observations.

By this Method we are pretty certain that the Period of the Comet which appeared in 1682 is seventy-five Years, because one of the same Kind appeared in 1607, 1531, and 1456; if it appears again in 1757, or 1758, we shall be more certain. That which appeared in 1661 will come again in 1790; and that which was seen in 1680, will be seen again 575 Years from that Time.

These Comets were formerly taken to be Forerunners of Plagues, Famine, and War, but this is found to be ill-grounded. However they may be physical Causes of very great Events, for as these Bodies move very freely in all Directions, it is possible that one of them may meet with some Planet, or even the Earth in its Course, and then, no Doubt, terrible Accidents will be produced. The first Thing will be a great Change in their Motions, and then will follow a great Alteration in the Axis and Poles of the Earth, that Part of the Earth that was near the Equator, will be near the Poles, and the contrary, they will likewise produce other Effects much more fatal; for these Comets have Tails, which are immense Torrents of Exhalations and Vapours, that the Heat of the Sun forces from these Bodies, for Comets have no Tails till they come near the Sun and which increase the nearer they approach, and diminish as they get at a Distance.

A Comet with its Tail may pass so near the Earth, that we may be overwhelmed with the Torrent it carries along

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with it, or in an Atmosphere of the same Nature that surrounds it. The Comet which drew near the Sun in 1680, was twenty-eight thousand Times more hot than the Earth in Summer, or according to Sir *Isaac Newton*, 2000 Times more hot than red-hot Iron, and that a Mass of red hot Iron as big as the Earth would take 50,000 Years to cool again, and if so, what Heat must the Comet have when arising from the Sun, it traversed the Orbit of the Earth? If it had passed nearer it would have reduced the Earth to Ashes or turned it into Glass, or if the Tail alone had reached us we should have been overwhelmed with a burning River, which would have killed all the Inhabitants just in the same Manner as boiling Water thrown upon a Nest of Ants destroys them all. Perhaps the Plagues said to have attended the Appearance of Comets may have proceeded from the Exhalations of the Comet, mixed with our Atmosphere, causing sensible Alterations therein fatal both to Animals and Plants; for it is very probable that Vapours brought from such a Distance, and excited by so great a Heat should be fatal to all Things on the Earth, producing Famine and Sickness.

But the worst Accident that can happen from a Shock of the Earth and a Comet, may be the breaking them both in pieces, which would prove the Destruction of them both, and yet the Force of Gravity might new mould them into one or more new Planets. However though it may be doubted whether this Earth has undergone such a Catastrophe or not, yet we are certain it must have undergone very great Disorders and Changes; the Print of Fishes and even Fishes themselves petrified or turned into Stone, at great Distances from the Sea, and even at the Tops of very high Mountains, are like so many Medals, as an incontestible Proof of some such Event.

A small Shock of a Comet might not break the Globe of the Earth all to pieces, but it might cause great Changes in the Situations of the Earth and Seas, the Waters during such a Shock might rise to a great Height in some Places and overwhelm vast Regions on the Surface of the Earth, which it would forsake afterwards; such a Shock may have occasioned the Floods mentioned in sacred and prophane Histories, for the irregular Dispositions of the Layers of the Earth, the whelming of Mountains upon Mountains, look more like the Ruins of the ancient World than the primitive State of one newly formed.

The same Thing may happen to *Mars*, *Venus*, or *Mercury*; but as for *Saturn* and *Jupiter* their Bulk is so enormous, that they seem less exposed to the Insults of a Comet; and it would be a wonderful Sight if we should live to perceive a Comet fall upon these lesser Planets and break them to Pieces, or carry them off, and turn them into Satellites.



Of the SPHERE as applied to GEOGRAPHY.

THE Word *Globe*, as well as that of *Sphere*, signifies a Ball; and the Earth is looked upon as a Ball, on Account of its Roundness; this is proved by Eclipses of the Moon, caused by the Shadow of the Earth upon the Moon. As the Earth and the whole Heavens turn, or seem to turn about the Earth, which in the Sphere is placed in the Centre of the World; the Geographers have transferred the greatest Part of the Circles of the Sphere to the Earth. By this means the Earth, as well as the Heavens, has its Poles, its Axis, its Equator, its Ecliptic, its Meridian, its Horizon, its Tropics, and its Polar Circles.

The *Poles* of the Earth are two Points on its Surface through which its Axis passes. The *Axis* of the Earth, which may be conceived to be the same as that of the World, is a Line which passes quite thro' the Earth. The *Equinoctial Line*, or *Equator*, is a Circle on the Surface of the Globe, opposite to the Equator in the Heavens; it cuts the Globe into two equal Parts, the North and the South. The *Ecliptic* on the Earth is a great Circle which answers to the Ecliptic in the Heavens; its greatest Distance from the Equator is twenty-three Degrees, twenty-nine minutes. The *Tropics* are lesser Circles, distant from the Equator 23 Degrees, 29 Minutes. The *Polar Circles* are small Circles at the same Distance from the Pole. The *Horizon* is a great Circle which divides the Globe into two Hemispheres, the upper and the lower; the Horizon of the Globe may become the Horizon of any Place or Town, by placing it under the grand Meridian, and by elevating the Pole above the Horizon to the Latitude of the Place. The *Meridian* is a great Circle which passes by the Poles of the Globe, and cuts the Horizon in the North and South Points; it likewise divides the Globe into two Parts, the East and the West.

Of GEOGRAPHY. 207

We may place the first Meridian where we will; some place it at *Ferro*, others at *London*, others at *Paris*, and others at *Pekin* in *China* in the Maps of that Country. The *Spaniards* place theirs at *Toledo*, the *Portuguese* at *Tercera* one of the *Azores*, and the *Dutch* at the *Pike of Teneriff*.

This leads me to speak of the *LONGITUDE*, which is the Distance from the first Meridian to the Meridian of the Place, or an Arch of a Parallel comprehended between the first Meridian and the Meridian of a Place.

The *LATITUDE* is the Distance of a Place from the Equator, and may be either North or South; or the Latitude of a Place is an Arch of the Meridian contained between the Equator and the Place; this is the same as the Elevation of the Pole above the Horizon. The Degree of Longitude may be reckoned along a Circle parallel to the Equator, and the Latitude by a great Circle that passes through the Poles.

The Degrees of Latitude are nearly equal; I say nearly, for as the Earth is flatted towards the Poles, every Degree increases a little from the Equator to the Poles, which however is neglected in the common Computations, though begun to be rectified in some Maps; they contain 69 and a Quarter of *English* Statute Miles, or 20 Marine Leagues, which is 60 Miles to a Degree; according to which the following Table is computed.

A TABLE, shewing the Quantity of the Degrees of a Longitude in every Parallel of Latitude.

	Lat.	Min.	Sec.		Lat.	Min.	Sec.
Equator	0	60	0		12	58	40
Parallel.	1	59	56		13	58	28
	2	59	54		14	58	12
	3	59	52		15	58	0
	4	59	50		16	57	40
	5	59	46		17	57	20
	6	59	40		18	57	4
	7	59	37		19	56	44
	8	59	24		20	56	24
	9	59	10		21	56	0
Parallel.	10	59	0		22	55	36
	11	58	52		23	55	12

TABLE *continued.*

Lat.	Min.	Sec.	Lat.	Min.	Sec.
24	54	48	58	31	48
25	54	24	59	31	0
26	54	0	60	30	0
27	53	28	61	29	4
28	53	0	62	28	8
29	52	28	63	27	12
30	51	56	64	26	16
31	51	24	65	25	20
32	50	52	66	24	24
33	50	20	67	23	28
34	49	44	68	22	32
35	49	8	69	21	36
36	48	32	70	20	32
37	47	56	71	19	32
38	47	16	72	18	32
39	46	36	73	17	32
40	46	0	74	16	32
41	45	16	75	15	32
42	44	36	76	14	32
43	43	52	77	13	32
44	43	8	78	12	32
45	42	24	79	11	28
46	41	40	80	10	24
47	41	0	81	9	20
48	40	8	82	8	20
49	39	20	83	7	20
50	38	32	84	6	12
51	37	44	85	5	12
52	37	00	86	4	12
53	36	08	87	3	12
54	35	26	88	2	4
55	34	24	89	1	4
56	33	32	90	0	0
57	32	40			

In general in Maps of the World, the Degrees of Longitude are placed on the Equator, and those of Latitude on the grand Meridian. In Maps of particular Places the Longitude is placed at the Top and the Bottom, and the Latitudes on the Right and Left.

Of the DIVISIONS of the EARTH formed by the Circles of the Globe.

THE first Division of the Earth is into Zones; for the Tropics and Polar Circles divide the Globe into five Parts called Zones. The *Torrid Zone* is contained between the Tropics, and is 27 Degrees in Breadth all round the Globe. Its Inhabitants are called *Amphiscians*, because they see the Shadow of the Sun turned sometimes towards one Pole and sometimes towards the other. The two *temperate Zones* are comprehended between the Tropics and the Polar Circles; they are 43 Degrees in Breadth, and the People which inhabit them are called *Heteroscians*, because the Shadow of the Sun at Noon always turns the same Way, the one towards the Pole Artic, and the other towards the Pole Antartic. The Two *frigid or frozen Zones* are contained between the Polar Circles and the Poles; they contain 23 Degrees and a half; those that live under them are called *Periscians*, because the Shadow always turns round about them, according to the different Motions of the Sun.

The second Division of the Earth is by Longitudes and Latitudes. As the Tropics and Polar Circles divide the Earth into five Zones, and from a triple Diversity of Shadows, so the Longitudes and Latitudes form a threefold Division of the Earth; those that inhabit the same Latitude in the same Hemisphere, at the Distance of 180 Degrees in Longitude, are called *Periæcians*, that is to say, circular Inhabitants; they live in the same Climate, but their Hours are opposite. Those that live in the same Longitude and Latitude, but in different Hemispheres, are called *Antæcians*, that is to say, opposite Inhabitants, their Seasons being opposite. Thus when it is Winter with those that live in the Northern Part, it is Summer with those that live in the Southern Part. The *Antipodes* are those that live directly opposite to each other; their Seasons, Days, and Hours are all contrary.



Of the CLIMATES.

THE *Climates* are Spaces on the Earth comprehended between two Parallels, at the End of which the Days are half an Hour or a Month longer. In order to under-

stand this Definition we must observe, that the longest Day under the Equator consists of 12 Hours, and in Proportion as we advance towards the Polar Circles, the Increase of the Days every half Hour makes a Climate. At the Polar Circles the longest Day is 24 Hours, and beyond these the Climates increase, not by half Hours, but by Months, as far as the Poles where the Day is six Months without taking notice of Twilight.

It may seem strange that the Climates of Hours should contract the Latitudes the nearer they come to the Pole, and that the Months enlarge them at the same time, insomuch that from the Equator to 59 Degrees, 14 Minutes, there are but twelve Climates, and yet from hence to 66 Degrees, 31 Minutes, there are twelve Climates. Likewise from the Polar Circle to 73 Degrees, 20 Minutes, there are three Climates of Months, and yet from thence to the Pole there are but three Climates. The first Disproportion arises from the Obliquity of the Tropics with the Horizon, and the second from the Progress of the Sun in the Ecliptic.

We may readily know the Climate a Town or City is placed in, provided we know the Length of the longest Day, by the Help of the following Table.

TABLE of CLIMATES and PARALLELS.

Climates.	Parallels.	Longest Day.		Latitude.		Amplitude.	
		H.	M.	deg.	min.	deg.	min.
Equator	0 Begin.	12	0	0	0		
1	1 Mid.	12	15	4	15	0	1
	2 End.	12	30	8	25	8	25
2	3 Mid.	12	45	12	30		
	4 End.	13	0	16	25	8	
3	5 Mid.	13	15	20	15		
	6 End.	13	30	23	50	7	25
4	7 Mid.	13	45	27	40		
	8 End.	14	0	30	20	6	30
5	9 Mid.	14	15	33	40		
	10 End.	14	30	36	28	6	8
6	11 Mid.	14	45	39	2		
	12 End.	15	0	41	22	4	52

TABLE

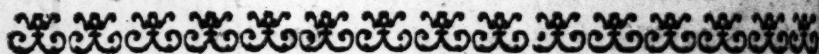
OF GEOGRAPHY. 211

TABLE Continued.

Climates.	Parallels.	Longest Day.		Latitude.		Amplitude.	
		H.	M.	deg.	min.	deg.	min.
7	13 Mid.	15	15	43	32		
	14 End.	15	30	45	29	4	7
8	15 Mid.	15	45	47	20		
	16 End.	16	0	49	1	3	31
9	17 Mid.	16	15	50	33		
	18 End.	16	30	51	58	3	7
10	19 Mid.	16	45	53	17		
	20 End.	17	0	54	27	2	49
11	21 Mid.	17	15	55	34		
	22 End.	17	30	56	37	2	10
12	23 Mid.	17	45	57	32		
	24 End.	18	0	58	29	1	52
13	25 Mid.	18	15	59	14		
	26 End.	18	30	59	58	1	29
14	27 Mid.	18	45	60	40		
	28 End.	19	0	61	18	1	20
15	29 Mid.	19	15	61	55		
	30 End.	19	30	62	25	1	7
16	31 Mid.	19	45	62	54		
	32 End.	20	0	63	22	0	57
17	33 Mid.	20	15	63	40		
	34 End.	20	30	64	6	0	44
18	35 Mid.	20	45	64	30		
	36 End.	21	0	64	49	0	43
19	37 Mid.	21	15	65	6		
	38 End.	21	30	65	21	0	32
20	39 Mid.	21	45	65	35		
	40 End.	22	0	65	47	0	16
21	41 Mid.	22	15	65	57		
	42 End.	22	30	66	6	0	19

TABLE *continued.*

Climates.	Parallels.	Longest Day.		Latitude.		Amplitude.	
		H.	M.	deg.	min.	deg.	min.
22	43 Mid.	22	45	66	14		
	44 End.	23	0	66	20	0	14
23	45 Mid.	23	15	66	25		
	46 End.	23	30	66	28	0	8
24	47 Mid.	23	45	66	30		
	48 End.	24	0	66	31	0	3
Months.							
	25		1	67	30	0	59
	26		2	69	30	2	0
	27		3	73	20	3	50
	28		4	78	20	5	0
	29		5	84	00	5	40
	30		6	90	00	6	0



A Description of the TERRESTRIAL GLOBE.

A Globe is a spherical or round Body whereon the Terrestrial Circles are inscribed, and the Countries exhibited to represent all Parts of the Earth. On some Globes the Towns are marked with (o), on others by the Shape of a little House; Rivers by a black Line; Roads by a double Line; or a double-pricked Line; Mountains by a Figure shaded like a Bell; the Sea by a green Colour, or white Space, &c.

The Appurtenances of a Globe are, first the Axis, represented by a Wire run through both Poles. 2. A Brazen Circle representing the first Meridian, wherein the Globe turns on its Axis. 3. A wooden Frame representing the Horizon, on which the Course of the Sun is inscribed, and within which the brazen Meridian turns by Means of the Notches. 4. The Horary Circle; it is fixed in the brazen Meridian in such a Manner as to make the Pole its Centre. 5. The Quadrant of Altitude; which is a thin

Bra's Plate screwed to the brazen Meridian, and graduated with 90 Degrees, answering to one fourth Part of the Equator. 6. The Semicircle of Position; this is a thin narrow Plate of Brass exactly answering to one half of the Equator, containing 180 Degrees. 7. The Compass; it is a round Circle like a Wheel, with 32 Points issuing from its Centre, one of which is a Flower de Luce, and points due North. It usually stands on the Pedestal of the Horizon.

The Globe is of great Use to explain Geography, that is, whatever relates to the terrestrial Circles, as well as the Properties of different Places. It is very easy and pleasant to Learners, and will explain a great Number of Problems, of which I shall give a few by Way of Example.

The Globe is rectified by raising the Pole to the given Latitude, as suppose *London*; then fix the Quadrant of Altitude in the Zenith, and by the Compass on the Pedestal set the Globe so that the brazen Meridian may stand due North and South, according to the Needle, and then it is done.

The various Seasons of the Year are explained by the Ecliptic, which is divided into four Parts by Colours, to distinguish the four Seasons of the Year, allowing three Signs to each. The Northern Hemisphere has for the Spring, *Aries*, *Taurus*, and *Gemini*; for the Summer, *Cancer*, *Leo*, and *Virgo*; for the Autumn, *Libra*, *Scorpio*, and *Sagittarius*; *Capricorn*, *Aquarius*, and *Pisces*, for the Winter. These three last Signs make the Summer in the Southern Hemisphere; and *Cancer*, *Leo*, and *Virgo*, the Winter. *Libra*, *Scorpio*, and *Sagittarius*, make the Spring; and *Aries*, *Taurus*, and *Gemini*, the Autumn; so that when it is Spring in one Hemisphere, it is Autumn in the other; and when it is Summer in one Hemisphere, it is Winter in the other.

To find the Longitude of a Place, as *Paris*; turn the Globe about till you bring this City under the Brass Meridian, and then the Degrees which the Meridian cuts on the Equator is the Longitude; likewise the Distance between the Equator and the Brass Meridian is the Latitude.

To find the Place of the Sun on a given Day, for Instance, the 18th of *August*; seek for this Day on the Horizon, and you will find the twenty-third Degree of *Leo*, in the Circle of the Signs. Then seek the same Degree in the Ecliptic, and you will see where the Place is on the Globe.

To find the Day wherein the Sun is perpendicular to any Place: Such a Place must be always in the Torrid Zone; Place the Town in Question, for Instance; *Goa*, which is in the sixteenth Degree of North Latitude, under the Brass Meridian, and observe what Degree of the Ecliptic will pass under this Latitude when the Globe is turned about, and you will find two; the 13th Degree of *Taurus*, and the 17th Degree of *Leo*. When the Sun therefore shall be in the 13th Degree of *Taurus*, on the 30th of *May*, or in the 17th Degree of *Leo*, on the 10th of *August*, it will be perpendicular to *Goa*.

To find the Rising and Setting of the Sun on the 20th of May. The Globe being rectified to the Latitude of the Place, seek for the Place of the Sun on that Day, which is 29 Degrees of *Taurus*. Then place *London* under the brazen Meridian, and bring the Hour Index to the South. Afterwards turn the Globe towards the East, till the 29th Degree of *Taurus* touches the Horizon; do the same on the West Side of the Globe, and the Index of the Hour Circle will point at eleven Minutes past Four in the Morning, and to forty-nine Minutes past Seven in the Evening.

To know what Hour it is at one Place when it is Noon at another. As for Example at *Vienna*, when it is Twelve at *Paris*. You must put *Paris* under the Brass Meridian, and the Index of the Hour Circle on the South. Then turn the Globe towards the West, till *Vienna* comes under the brazen Meridian, and the Index will point to One in the Afternoon. The Reason of this is, that *Vienna* is more East than *Paris* one Hour, or fifteen Degrees. You may do the same for a Town that lies West.

But though the Globe is of great Use in these and many other Particulars, yet the following Tables will give a more exact Account of the *Length of Days and Nights*, and the *Rising and Setting of the Sun*, than can be gained by the largest hitherto published. But it will be proper to observe, that these Tables give the Times when the Sun appears to rise and set; for the Refraction of the Sun, which is 32 Minutes at the Horizon, raises the Sun above it sooner in the Morning, and later at Night, than the common Tables.

Of GEOGRAPHY. 215

A TABLE of the SUN's Semi-diurnal Arches, or Times of his visible half Tarriance above the Horizon.

The SUN's Declination North.						
Degr.	La. 49		La. 50		La. 51	
	h.	m.	h.	m.	h.	m.
0	6	4	6	4	6	4
1	6	8	6	8	6	9
2	6	12	6	13	6	14
3	6	16	6	18	6	19
4	6	22	6	22	6	25
5	6	26	6	27	6	29
6	6	31	6	32	6	34
7	6	36	6	37	6	40
8	6	41	6	42	6	45
9	6	46	6	47	6	51
10	6	50	6	53	6	56
11	6	55	6	57	7	1
12	7	0	7	2	7	7
13	7	5	7	7	7	12
14	7	10	7	13	7	18
15	7	15	7	18	7	24
16	7	20	7	24	7	31
17	7	26	7	29	7	36
18	7	31	7	34	7	42
19	7	37	7	41	7	49
20	7	43	7	47	7	55
21	7	49	7	53	8	3
22	7	55	7	59	8	9
23	8	1	8	6	8	17
23 $\frac{1}{2}$	8	4	8	9	8	20

By these Tables the Times of the Sun's Rising and Setting may be found, in any Part of the Kingdom of *Great-Britain* or *Ireland*, after the following Manner: Where the Latitude of the Place is known, take the Sun's Declination out of the Table, on the Noon of the Day you desire to know the Time of his Rising and Setting, and with it, according as it is either North or South, enter these Tables in the Left-hand Column, under the Word Degrees; then look for the Latitude of the Place in the Top of the Table;

216 Of GEOGRAPHY.

A TABLE of the SUN's Semi-diurnal Arches, or Times of his visible half Tarriance above the Horizon.

The SUN's Declination South.						
Degr.	La. 49	La. 50	La. 51	La. 52	La. 53	La. 54
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
0	6 4	6 4	6 4	6 4	6 4	6 4
1	5 59	5 59	5 58	5 58	5 58	5 58
2	5 54	5 54	5 53	5 53	5 53	5 53
3	5 49	5 49	5 49	5 49	5 49	5 47
4	5 45	5 45	5 45	5 43	5 42	5 41
5	5 41	5 39	5 39	5 38	5 37	5 36
6	5 35	5 35	5 34	5 33	5 32	5 30
7	5 31	5 30	5 29	5 27	5 26	5 25
8	5 26	5 25	5 23	5 21	5 21	5 20
9	5 21	5 20	5 18	5 17	5 16	5 13
10	5 17	5 14	5 14	5 11	5 10	5 8
11	5 13	5 10	5 8	5 6	5 4	5 2
12	5 7	5 5	5 3	5 0	4 57	4 56
13	5 2	5 0	4 57	4 55	4 52	4 51
14	4 57	4 54	4 50	4 49	4 47	4 41
15	4 52	4 49	4 40	4 44	4 41	4 37
16	4 46	4 45	4 42	4 38	4 34	4 31
17	4 41	4 38	4 35	4 32	4 28	4 23
18	4 36	4 32	4 29	4 26	4 22	4 18
19	4 31	4 23	4 23	4 19	4 14	4 12
20	4 25	4 20	4 17	4 14	4 9	4 4
21	4 19	4 15	4 11	4 6	4 2	3 57
22	4 13	4 9	4 4	4 0	3 55	3 50
23	4 7	4 3	3 57	3 53	3 47	3 42
23 $\frac{1}{2}$	4 4	4 0	3 55	3 50	3 44	3 38

Table; and in that Column, against the Sun's Declination, will be found the Time of his visible half Tarriance above the Horizon, or Time of his Setting, correct by Refraction; then substraet the Time of his Setting from 12 Hours, the Remainder will be the Time of his Rising; double the Time of his Setting, the Sum will be the Length of the Day; and double the Time of his Rising, the Sum will be the Length of the Night. But if the Latitude of the Place, and Declination of the Sun, consist of Degrees and Minutes, then

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A TABLE of the SUN's Semi-diurnal Arches, or Times of his visible half Tarriance above the Horizon.

The SUN's Declination North.													
Decl.	La. 55		La. 56		La. 57		La. 58		La. 59		La. 60		
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	
0	5	4	6	4	6	4	6	4	6	4	6	4	
1	6	9	6	10	6	10	6	10	6	11	6	11	
2	6	15	6	16	6	16	6	17	6	17	6	18	
3	6	20	6	22	6	23	6	23	6	24	6	25	
4	6	26	6	28	6	29	6	30	6	31	6	31	
5	6	32	6	35	6	35	6	36	6	38	6	39	
6	6	38	6	40	6	41	6	43	6	44	6	46	
7	6	44	6	46	6	48	6	49	6	51	6	53	
8	6	50	6	52	6	55	6	58	6	56	7	1	
9	6	56	6	58	7	1	7	3	7	5	7	8	
10	7	3	7	5	7	7	7	10	7	13	7	16	
11	7	8	7	10	7	14	7	17	7	20	7	23	
12	7	15	7	18	7	22	7	24	7	27	7	31	
13	7	21	7	24	7	28	7	31	7	35	7	39	
14	7	28	7	31	7	35	7	38	7	43	7	47	
15	7	34	7	39	7	42	7	46	7	51	7	56	
16	7	41	7	45	7	49	7	54	7	59	8	4	
17	7	49	7	52	7	57	8	2	8	7	8	13	
18	7	55	8	1	8	4	8	10	8	16	8	22	
19	8	2	8	7	8	13	8	19	8	25	8	32	
20	8	10	8	15	8	21	8	28	8	35	8	42	
21	8	18	8	24	8	30	8	37	8	45	8	53	
22	8	26	8	32	8	39	8	47	8	55	9	4	
23	8	34	8	41	8	50	8	57	9	6	9	16	
23½	8	39	8	46	8	54	9	2	9	12	9	21	

a small Allowance must be made for the Minutes in both Cases, which may be done by a Person of an ordinary Capacity, by a mental Proportion only. Thus to find the Time of the Sun's Rising and Setting at *Aberdeen in Scotland*, on the longest Day, the Latitude of that Place is accounted 57 Deg. 7 Min. North, and the Sun's Declination 23 Deg. 29 Min. likewise North. By these you will find by the Table, that 4 Min. for the Sun's Declination, and

U

1 Min.

A TABLE of the SUN's Semi-diurnal Arches, or Times of his visible half Tarriance above the Horizon.

The SUN's Declination South.						
Degr.	La. 55		La. 56		La. 57	
	h.	m.	h.	m.	h.	m.
0	6	4	6	4	6	4
1	5	58	5	58	5	58
2	5	52	5	52	5	51
3	5	47	5	46	5	45
4	5	41	5	40	5	39
5	5	35	5	34	5	33
6	5	29	5	28	5	27
7	5	23	5	22	5	20
8	5	17	5	16	5	14
9	5	12	5	10	5	8
10	5	5	5	3	4	59
11	4	59	4	57	4	54
12	4	53	4	51	4	48
13	4	47	4	44	4	41
14	4	41	4	37	4	34
15	4	34	4	31	4	27
16	4	27	4	24	4	20
17	4	21	4	17	4	12
18	4	14	4	9	4	5
19	4	7	4	2	4	56
20	3	59	3	54	3	49
21	3	52	3	46	3	40
22	3	44	3	38	3	31
23	3	36	3	29	3	23
23½	3	31	3	24	3	18

1 Min. for the Latitude of the Place, are both to be added to 8 Hours, 50 Min. the Time belonging to 57 Deg. of Latitude, and 23 Deg. of North Declination, and the Sum will be 8 Hours, 55 Min. the Time of his apparent Setting at *Aberdeen*, on the longest Day, whose Complement to 12 Hours, *viz.* 3 Hours, 5 Minutes, will be the Time of his Rising, &c.

Explanation

Of GEOGRAPHY.

219

Explanation of the Terms used in GEOGRAPHY.

THE Word *Geography* comes from the *Greek*, and signifies a *Description of the Earth*. By the *Earth* is to be understood the great *Globe* composed of the *Earth* and *Water*, and called the *Terrestrial Globe*.

Chorography is the *Description of a Province or County*, as *Yorkshire*.

Topography, the *Description of a particular Place*, as a *Town, City, &c.*

Hydrography is a *Description of the Water*, particularly of the *Sea*.

Maps may be divided into *general* and *particular*. The whole *World* is generally represented in two *Planispheres*, though sometimes in a *Chart*, according to *Mercator's Projection*. This is the most general *Map*. The *Maps of Europe, of Asia, Africa, and America*, are likewise general *Maps*. Likewise the *Map of England* may be so called, with regard to the *Counties* of which it consists. *Particular Maps* represent particular *Counties, Provinces, or Countries*.

Geography, like other *Sciences*, has certain *Terms* proper to itself, and which it will be necessary to explain. There are two *Sorts*; some regard the *EARTH*, and some respect the *WATER*. Those that regard the *EARTH* are

Terra-firma, or the *Continent*, which is a great *Part* of the *Earth*, comprehending several *Countries*, not separated by the *Sea*. Thus *Europe* is a *Continent*.

An *Island*, or *Isle*, is a *Portion* of the *Earth*, intirely furrounded with *Water*. A *Peninsula*, or *Chersonese*, is *Land* almost furrounded with *Water*, and is connected to the *Continent* by a *Neck* of *Land*. An *Isthmus* is a *Neck* of *Land* inclosed by two *Seas*, and serves to unite the *Continent* to the *Peninsula*.

A *Promontory* is a *Part* of the *Earth* which advances into the *Sea*; when it rises like a *Mountain*, it is called a *Cape*, but when the *Elevation* is inconsiderable, it is called a *Point*.

Downs are hilly *Plains*, or *Hills* consisting of *Sand* and *Gravel*. This Word is often taken for a *Part* of the *Sea* lying near the *Sand-Banks* on the *Coast* of *Kent*. Some take them for *Sand-Hills* on the *Sea-Coasts*, which serve as

a Barrier to the Sea ; but if this were the Sense, what would become of *Banstead-Downs, Marlborough-Downs, &c.*

A *Mountain* is a Part of Land rising greatly above the Plain.

The *WATER* is divided into six Parts, Oceans, Seas, Gulphs, Straits, Lakes, and Rivers.

An *Ocean* is a large Collection of Waters, surrounding or invironing a considerable Part of the Continent, as the *Northern* and *Atlantic* Oceans.

A *Sea* is a less Collection of Waters, or Part of an Ocean, as the *British* Sea, and the *Irish* Sea.

A *Gulph* is surrounded with Land except in one Part, where it communicates with the Sea or Ocean, as the *Mediterranean*, the Gulph of *Venice*, the *Baltic*, and the *Black* Sea.

A *Strait* is a narrow Passage between two Seas, as the Straits of *Gibraltar*.

A *Lake* is a Collection of Standing Water, surrounded by Land and having no Communication by Sea, as the Lake of *Geneva*, the Lake *Aral*, and the *Caspian* Sea, which is properly a Lake.

A *River* is a Stream of fresh Water, which runs thro' the Land from its own Spring, till it falls into the Sea. However, these Streams generally rise from different Sources, and are at first called Brooks or Rivulets, and run into larger Streams, which are properly called Rivers.



The general Division of the EARTH and SEA.

THE Terrestrial Globe may be divided into two Parts, the *Earth* and the *Sea*. The Earth may be divided into known and unknown Lands. The latter includes such Parts as are yet undiscovered, of which there are doubtless many ; as also those that are, but partly known by visiting the Coast. The known Land is divided into two great Continents, the Old containing *Europe, Asia, and Africa*, and the New containing *America*.

EUROPE has *Denmark, Norway, Sweden, Muscovy or Russia*, towards the North ; *France, Germany, Poland, Bohemia, and Hungary*, about the Middle ; *Spain, Portugal, Italy, and Turkey in Europe*, on the South.

Asia

ASIA has that Part of *Russia* next to *Europe* and *Tartary* belonging to the *Muscovites* in the North; *Turkey* in *Asia*, *Persia*, *Great Tartary* and *China*, about the Middle; and *Arabia*, the *Mogul's* Country, and the *Peninsulas* on both Sides the *Ganges* in the South.

AFRICA has *Barbary*, *Egypt*, *Nigritia*, *Guinea*, *Nubia*, *Abyssinia*, &c. on this Side the Equator; and *Congo*, *Zanquebar*, *Monoemugi*, *Monomotapa*, and the *Hottentots* beyond it.

AMERICA is divided into the North and South. The North contains *New France*, *Nova Scotia*, *New England*, *Maryland*, *Pensylvania*, *Virginia*, *Carolina*, *Georgia*, *New Mexico*, and *California*. The South contains *Terra Firma*, *Peru*, *Brasil*, the Land of the *Amazons*, *Paraguay*, *Chili* and *Terra Magellanica*.

The *Islands* of *Europe* in the Ocean are *Great Britain*, *Ireland*, *Iceland*, and the *Islands* of the *Baltic*. In the *Mediterranean* are *Majorca* and *Minorca*, *Malta*, *Sicily*, *Sardinia*, *Corfica*, *Candy*, *Corfu*, and the *Islands* of the *Archipelago*.

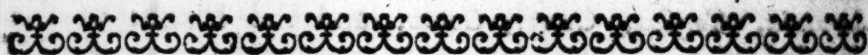
The *Islands* of *Asia* in the Ocean are the *Maldives*, *Ceylon*, *Sumatra*, *Java*, *Borneo*, called the *Isles* of *Sunda*; the *Moluccas*, the *Phillippines*, the *Isles* of *Japan* and *Formosa*. Add to these the *Isle* of *Cyprus* in the *Mediterranean*, and *Rhodes*.

The *Islands* of *Africa* are the *Canaries*, the *Islands* of *Madeira*, the *Cape De Verd* *Islands*, *St. Thomas*, *Ascension*, *St. Helena*, &c. all these lie on the West. On the East are the *Isles* of *Madagascar*, *Comorro*, and *Bourbon*; with a great many small ones on the Coast of *Zanquebar*. Likewise *Zocotora* on the *Arabian* Coast, near *Cape Guardafui*.

The *Islands* of *America* on the East, are those of *Fernando de Naronba*, near the Coast of *Brasil*; and *Saxemberg*, *Pepys*, and *Malouines* off the *Magellanic* Coast. On the West Coast near *Peru* lie those of *Cocos* and the *Gallopegas*. On the Coast of *Chili*, *St. Felix*, and *Juan Fernandez*. And farther in the Ocean the *Isles* of *St. Paul*, of the *Marquis* of *Mendoza*, *Fernando Quiros* and *Solomon*. The *Isles* on the South are those of *Terra del Fuego*, including the *Islands* *Van Staten*. On the East the lesser *Isles* of the *Straits* of *Magellan*. On the North and East Side are *Newfoundland*, *Bermudas*, the *Lucayas* or *Bahama* *Islands*. The *Antilles* or *Caribbee* *Islands*, and many others.

The SEA is divided into the Exterior, or that which surrounds the Continent and the Interior, or that which is contained within the Continent. The former is divided into 1. The *North* or *Frozen* Ocean; 2. The *Indian* Sea or Ocean; 3. The *Oriental* Ocean; 4. The *Western* Ocean; 5. The *Southern* Ocean; 6. The *Great South* Sea, or *Pacific* Ocean.

The Seas within the Continent are the *Mediterranean*, the *Baltic*, the *White* Sea or Gulph of *Russia*; the *Black* or *Euxine* Sea; the Sea of *Zabach*, or the Sea of *Azoph*, formerly called *Palus Mæotis*, near the *Black* Sea; the Sea of *Marmora*, otherwise called the *Propontis*; the *Caspian* Sea, which is properly only a Lake; the *Red* Sea, or the *Arabian* Gulph; the *Persian* Gulph between *Arabia* and *Persia*; the *Vermillion* Sea near *California*; the Gulph of *St. Lawrence*, near *Newfoundland*; the Gulph of *Mexico*; the Sea of *Korea*, and the Sea of *Kamschatka*.



Of the principal Isthmuses, Gulphs, Straits, Lakes, and Rivers.

AN ISTHMUS is a Part of the Earth shut in between two Seas, and joins one Land to another, of which there are two very considerable in *Europe*, viz. the Isthmus of *Corinth*, which joins the *Morea* to *Greece*, and the Isthmus of *Precop*, which unites little *Tartary* with the *Crimea*.

The most remarkable Isthmus in *Asia* is that of *Tenacirim*, which joins the Peninsula of *Malacca* with the Kingdom of *Siam*. In *Africa* there is likewise only one, and that is the Isthmus of *Suez*, which unite *Asia* with *Africa*. They formerly attempted to make a Canal from one Sea to the other; but the Design miscarried. In *America* there is the Isthmus of *Panama*, which separates *North America* from the *South*.

The Ocean forms eight remarkable Gulphs. There are three in *Europe*, which have the Name of Seas; the *Mediterranean*, the *Baltic* Sea, and the *White* Sea. There are three in *Asia*, the Gulph of *Bengal*, the *Persian* Gulph, and the *Arabian* Gulph or *Red* Sea. There are two in *America*, the Gulph of *California* or the *Vermillion* Sea.

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The most famous Straits are *Hudson's Straits* in the North Part of *America*, and the Straits of *Magellan* in the South. The Lesser Straits are those of *Gibraltar*, between *Africa* and *Europe*, and which permit the Ocean to enter into the *Mediterranean*: The Straits of *Babelmandel*, between *Asia* and *Africa*, and which join the *Red Sea* to the Ocean: The Straits called the *Sound*, which unites the *Baltic* with the *German Ocean*.

The most famous Lakes are the *Ladoga* and *Onega* in the Confines of *Muscovy*. The *Caspian Sea*; to the East of which lies the Lake *Aral*, but lately known to be of great Extent, and seems to be mistaken by some for the *Caspian Sea*; the Lake *Baikal*; these last are in *Asia*. To which add several Lakes in North *America*, of which the superior or upper Lake is the principal.

The principal Rivers in *Europe* are the *Thames* in *England*, the *Torneo* in *Sweden*, at the Bottom of the Gulph of *Bothnia*; the *Volga* in *Russia*, which runs into the *Caspian Sea*; the *Danube*, which rises in *Germany* and runs thro' *Turkey* in *Europe* into the *Black Sea*; the *Don* or *Tanais* in *Russia*, which runs into the Sea of *Azoph*; the *Nieper* which rises in *Poland*, and empties itself into the *Black Sea*; the *Rhine* in *Germany*; the *Loire* in *France*; the *Po* in *Italy*; and the *Tagus* in *Spain*.

In *Asia* there are the *Euphrates*, which rises in the Mountains of *Armenia*, and runs on the East Side of the Deserts of *Arabia*, till it comes to the Place where *Babylon* formerly stood, and uniting itself with the *Tigris* soon after it passes by *Basra* and falls into the *Persian Gulph*; the *Tigris*, which has its Source a little lower, and running towards the South passes by *Mosul* and *Bagdad*, after which it unites its Stream with the former, and empties itself into the *Persian Gulph*; the *Indus*, this runs from North to South, dividing *Persia* from the *Mogul's Country*, and falls into the *Indian Ocean*; the *Ganges* likewise runs from North to South on the East Side of the *Mogul's Country*, and falls into the Gulph of *Bengal*. The chief Rivers in *China* are the *Kan-ho* or the *Yellow River*, and the *Kyang* or the *Yang tse Kyang*, both which run through the Country from West to East. The chief Rivers in *Siberia* are the *Irtish*, the *Obi*, the *Tobol*, the *Jenisca*, and the *Selinga*; and the principal in great *Tartary* is the *Segalian*.

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The chief Rivers in *Africa* are the *Nile*, the *Gambia*, the *Senega*, and the *Zaire*. The *Nile* rises in the Mountains of *Abyssinia*, and runs from South to North through *Ethiopia* and *Egypt* into the *Mediterranean*. The excessive Rains in the South Parts cause it to overflow the lower Parts of *Egypt* once a Year, which renders it a very plentiful Country for Corn.

There are two considerable Rivers in North *America*, the River of St. *Laurence*, and the *Mississipi*, besides many others, which are navigable, in our *English* Plantations. In South *America* the River of the *Amazons*, which is supposed to be the greatest River in the World, and the *Paraguay* or *la Plata*.



Of the different Religions of the World, and their Extent.

ALL the Religions in the World may be reduced to Four, the *Pagan*, *Jewish*, *Christian*, and *Mahometan*, to which some add the *Natural*.

The *Pagan* Religion is owing to the Inventions of Men, and consists of various Kinds of Idolatry and extravagant Opinions; it teaches the Worshipping of Images, various Sacrifices, the Agency of Demons, and many other superstitious Practices. This was the Religion of the ancient *Greeks* and *Romans*, the People of *America*, and various other Parts. It is now extended over half *Asia*, five or six Parts of *Africa*, and nineteen in twenty of *America*.

The *Persians* formerly worshipped the Sun and Fire, but since *Mahometanism* is become the prevailing Faith, there are but few who profess this ancient Religion. However, some are established on the Borders of the Countries near to *Persia*, and in the Peninsula on this Side the *Ganges*. Nevertheless these Idolaters pretend they believe in one God, and that the Fire is his Image. They are called *Gaurs* or *Gebres*.

The Religion of the *Brachmans* was formerly the principal in the *Mogul's* Country, and in the Peninsula on this Side the *Ganges*, even till *Mahometanism* was established. It is now mostly cultivated by the natural Inhabitants. It is still prevalent in the other Dominions of this Peninsula, and in the Countries of the *Rajas*, who keep their Ground

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against the *Mogul*. These *Rajas* are little Sovereign Princes who do Homage to the great *Mogul* or pay him Tribute.

The *Brachmans* or *Gymnosophists* were very severe Philosophers, who, according to *Porphry*, made profession of a Kind of Monastic Life. The *Bramins* who succeeded them are Indian Priests, who are of the ancient Religion of the *Banians*, who are Idolaters of the *Indies*. They believe the Transmigration of Souls. The *Bramins* and all their Followers have a great Veneration for a Cow, and they think themselves happy when they die holding one of their Tails.

The *Chinese*, in general, acknowledge no other God but Heaven. However, there are several Sects among them. That which is called the learned Sect, though they pay no regard to Idols, are said to pay a Homage to the Sun, Moon, and Stars. Others have Idol Temples, and yet both one and the other have a great Regard for *Confucius*.

The most extensive Form of Religion is that of *Fo*, for this prevails over *Thibet*, all the Western *Tartary*, as well as *China*, and most of the *Indian* Islands. It pretends to Revelation, and teaches all the Superstitions above-mentioned.

The Worship of the Sun before Christianity, was of all Religions the most general; it was even found in *America*, for the People of *Peru* worshipped the Sun, as also those of *Florida*; and some in *New Mexico* worship him till this Day. Some other Nations of *America* are thought to adore some imaginary Demon, and to use Conjurations by such Means; but however Travellers may have been imposed upon by their fantastic Ceremonies, there are now very few in *Protestant* Countries, who believe any Thing of these diabolical Stories.

The *Jewish* Religion has its name from the *Jews*, a People of *Syria* in *Africa*, and was instituted by *Moses* about 3194 Years ago. It was intended to restore natural Religion then decayed in the World. It consists chiefly in the Belief of one God: But the *Jews* were such a stubborn unbelieving Race of Mortals, that no Miracles could prevent them from relapsing into Idolatry, till they had endured the *Babylonish* Captivity, after which they seem to be pretty firm in their Belief, till they were divided into various Sects. The abstaining from Hog's Flesh was probably a temporary Law given to them because it is bad for the Leprosy. But they strictly adhering to the Letter hold

hold it in the utmost Abhorrence even at this Day. It is now the prevailing Religion of no Country, the *Jews* being no longer a Nation, but scattered over all Parts of the Earth: But more particularly *Europe*, the South Part of *Asia*, and the North Part of *Africa*, where they are very numerous.

The *Christian* Religion takes its Name from *Jesus Christ*, who was born in *Judea* 1759 Years ago, and was crucified, as a Malefactor, about the Age of 33, for teaching his Doctrines. It abolishes the *Jewish* Priesthood, and changes the Day of Worship from *Saturday* to *Sunday*. The moral Part of it surpasses all other Religions in the World, it being the highest Improvement of the Law of Nature. *Christianity* extends almost all over *Europe*, and several Parts of *America*, as the established Religion, where the *Europeans* have any Possession, and it is professed by different People in the *Turkish* Dominions, and is dispersed thro' several Regions of *Asia* and *Africa*. But it is so degenerated in many Places, that there remains nothing but the Name, particularly in *Abyssinia*, *Armenia*, and the Countries to the East of the *Black Sea*. In *Europe* it is divided into three principal Branches, the *Roman Catholic*, the *Greek Church*, and the *Protestants*. The *Greeks* are divided into three Sects, those that have renounced the Supremacy of the Pope of *Rome*, those that are *Jacobites*, *Coptes* or *Eutychians*, and those that are *Nestorians*. The *Protestants* are divided into several Branches, the *Lutheran*, the *Episcopal*, the *Calvinist*, the *Presbyterian*, the *Baptist*, *Quakerism*, and *Socinianism*, and many other Sects of lesser Note.

The *Mahometan* or *Mahomedan* is derived from *Mahomet* an *Arabian*, who published it as a Revelation 622 Years after *Christ*, and by Means thereof became Sovereign of *Arabia*. This Religion differs very little from that of the *Jewish*, except in acknowledging *Mahomet* to be the Prophet of God, their frequent Ablutions and other Ceremonies. They have changed the Day of Worship from *Saturday* to *Friday*.

Mahometanism is the chief Religion in the *Turkish* Empire, and the only one in *Arabia*. It is spread all over *Persia*, the *Mogul's* Empire, and many of the *Indian* Islands on the Northern and Eastern Coasts of *Africa*, with many of the inland Countries. Some affirm it six times more extended than *Christianity*. However it has not penetrated into *America*.

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Of the different Languages, and the different Colours, of the Inhabitants of the Earth.

THE most general Languages are the *Latin*, the *Teutonic*, the *Celtic* or *Keltic*, the *Sclavonian*, the *Greek*, the *Turkish*, the *Eastern Syriac*, the *Arabic*, the *Tartarian*, the *Manchew*, the *Chinese*, the *Malayan*, the *Ethiopic*. As for the Languages of *Africa* and *America*, they are so many it would be a great Labour to reckon them up.

As to the Extent of these Languages, the *Latin* is a dead Language; but the *Italian* is a Corruption of it as well as the *Spanish* and *French*. The *Teutonic* Language is spoken in *Germany* and *Scandinavia*. The *English* is a Mixture of *Latin*, *Teutonic*, and *Norman*. The *Danish*, *Dutch*, *Flemish*, and *Swedish* are derived from the *German*.

The *Sclavonian* has produced the *Dalmatian*, *Bosnian*, *Albanian*, *Servian*, *Bulgarian*, *Moldavian*, *Bohemian*, *Silesian*, the *Polish*, *Russian*, *Mingrelian*, and *Circassian*. The *Turkish* prevails over *Turkey* and a great Part of the *Eastern Tartary*. The *Eastern Syriac* or *Chaldaic* is the Mother of the *Western Syriac*, the *Hebrew*, the *Arabic*, and the *Abyssinian* Languages. The *Malayan* prevails over a great Part of the farther *Indies* and the *Islands*. The *Chinese* is spoken throughout *China*. The *Manchew* prevails in *Eastern Tartary*. The *Celtic* seems to be the original and most general Language of *Europe*. It is still preserved in *Wales*, *Bretagne*, and the North of *Scotland*, and particularly in *Ireland*.

The *Greek* made a Progress wherever that Empire prevailed. It is now spoken in the South Part of *Turky* in *Europe*, that is in ancient *Greece*, the *Islands* of the *Archipelago*, and *Natolea*, but much corrupted.

The COLOURS of the Inhabitants of the Earth are four,
1. *White*; 2. *Tawny*; 3. *Black*; and 4. *Red*.

The Inhabitants of *Europe* are *White*, as well as Part of the *Asiatics*, that is *Natolia*, *Armenia*, *Georgia*, the Northern Provinces of *Persia*, and about the *Caspian Sea*, *Grand Tartary*, and the Northern Parts of *China*.

The *Tawny* or *Brown* inhabit a great Part of *Barbary*, *Egypt*, *Zara*, *Zanguebar*. In *Asia* they dwell in *Syria*, *Diarbeker*, *Arabia*, the Southern Parts of *China*, the *Islands* of *Ceylon*, the *Maldives*, *Sunda*, the *Moluccas*, and the *Philip-*

Philippines; the *Indians* are of this yellowish tawny, and those that are more brown, are only made so by the scorching Heat of the Sun.

The Inhabitants of *Africa* are generally Black, except those first mentioned; so likewise are those of some Parts of *Asia*, *New Guinea*, and *New Holland*. The *Americans* are Red from one End of that vast Continent to the other; and if they appear of a more dusky Complexion in some Parts, it is because they daub themselves with Bear's Grease and other unctious Substances.

Mankind differ much in their Figure and Shape; they are generally reduced to four Kinds; the *Europeans* have a particular Aspect well known to all. But out of these we must except little *Tartary* and the North Part of *Russia*. However the Inhabitants of *Barbary* have Features not unlike those of the People of *Europe*; as also *Turky* in *Asia*, and the *Indians* on this Side the *Ganges*, have some Resemblance.

The second Sort are the *Chinese*, the *Tartars* the Inhabitants of the Peninsula beyond the *Ganges*, the Islands of *Japan*, the *Philippines*, the *Molluccas* and the Isles of *Sunda*; these have flat Noses, the Visage extremely flat, and the Eyes oval or narrow.

The third Kind comprehends the *Laplanders*, and the *Samayoids*, who are long-visaged, frightful, and have somewhat of the Aspect of a Bear.

The fourth are the Blacks of *Africa*, who have woolly Heads, flat Noses, and thick Lips; their Tongues, and the Inside of their Mouths, are as red as Coral.

The fifth are the *Americans*, who are without Beards, and without Hair on any Part of their Bodies except the Head, where it is long and black, when they will suffer it to grow; they go generally naked, some quite so, and others only cover those Parts which Decency requires them to hide. It is the same in *Africa* from Cape *De Verd* to the Cape of *Good Hope*, in the New-discovered Countries to the South, and many other Places of the World.

I know many Authors have asserted, that the *Americans* pull up their Beards by the Roots, in which they only copy one another; but who can imagine that in such a vast Country as *America*, all the People, with one Consent, should agree to pluck out their Beards? Besides it is no very rare Matter

Maritime County, has 37 Parishes in it, and three Market Towns. The Hills in this Part of *Wales* are so very high, that it requires a Day's Journey to reach the Summits of them.

CAERNARVONSHIRE is about 40 Miles long and near 20 over. It is a Maritime County, has 68 Parishes and 5 Market Towns, whereof 1. *Caernarvon* is the principal; 2. *Bangor*, which is an episcopal See under the Archbishop of *Canterbury*.

DENBIGHSHIRE is about 30 Miles long, and near 18 Miles broad. It is a Maritime County, has 57 Parishes, and 4 Market Towns; the principal whereof is *Denbigh*.

FLINTSHIRE is about 24 Miles long, and near 8 Miles broad. It has 21 Parishes and 2 Market Towns; whereof 1. *Flint* is the County Town, and 2. *St. Asaph*, which is a Bishop's See under the Archbishop of *Canterbury*.

There are two Islands in the *Irish Sea*, the one is called *ANGLESEY*, and the other the *ISLE OF MAN*.

The Island of *ANGLESEY* is about 20 Miles long, and 17 broad. It has 74 Parishes in it, and 2 Market Towns. It is divided from *Caernarvonshire* by a narrow Strait about 2 Miles over.

The *ISLE OF MAN* is about 30 Miles long, and near 10 Miles broad. It contains 17 Parishes and 5 Market Towns. It was taken from the *Scots* by an old Earl of *Salisbury*, who afterwards enjoyed it with the Title of *King in Man*.

SOUTH WALES is subdivided into six Counties, namely, 1. *Glomorganshire*, 2. *Brecknockshire*, 3. *Caermarthenshire*, 4. *Pembrokeshire*, 5. *Cardiganshire*, and, 6. *Radnorshire*.

GLAMORGANSHIRE is 40 Miles long, and 30 broad. It has 18 Parishes and 11 Market Towns. The Place of most Note is *Landaff*, which is an Episcopal See under the Archbishop of *Canterbury*.

BRECKNOCKSHIRE is about thirty Miles in Length and near 20 in Breadth. It has 61 Parishes and 4 Market Towns; amongst which, *Brecknock* is the principal. This Place is walled round, and has a Castle belonging to it.

CAERMARTHENSHIRE is about 35 Miles long, and 20 broad. It has 87 Parishes and 8 Market Towns. The Place of most Note is *Caermarthen*; which was the Birth-place of that celebrated *British* Enchanter *Merlin*.

PEMBROKESHIRE is about 26 Miles long, and near 20 broad, it has 145 Parishes, 8 Market Towns, and 16 Castles. The Places of most Note are 1. *Pembroke*, 2. *Milford-Haven*; which is looked upon as the best in *England*; having 13 Roads, 16 Creeks, and 5 Bays, 3. *St. David's*, which is a City and an Episcopal See, under the Archbishop of *Canterbury*.

CARDIGANSHIRE is about 32 Miles long; and 15 broad. It has 64 Parishes and 4 Market Towns: The principal whereof is *Cardigan*.

RADNORSHIRE is 24 Miles long and 22 broad.

ENGLAND, in general, is a Country which enjoys a temperate Air, the Soil produces plenty of Grain and Fruit; but little Wine and Oil, with which it is supplied from other Countries: As for Beer there is none so good in all the Northern Countries. It abounds with Cattle, Game, Fish, &c. and in short is blessed with all the real Necessaries of Life.

The *English* are curious, inquisitive, of a quick and penetrating Wit, deep Knowledge, and a solid Judgment; they are brave, being both good Soldiers and Seamen; of a ready Genius for mechanical Arts, and Improvers of whatever they undertake.

The establish'd Religion in *England* is the *Protestant*, but it is divided into two Parties: The one is the Church of *England* as by Law establish'd, and the Members thereof are distinguished by the Name of Church-Men: The other Party, who assemble in Meeting-Houses, for the Performance of Divine Worship, are distinguished by the Name of *Dissenters*.

The principal Rivers in *England* are, 1. the *Thames*, 2. the *Severn*, 3. the *Ouse*, 4. the *Med-way*, 5. the *Trent*, and 6. the *Humber*, which last is rather an Arm of the Sea, into which several Rivers empty themselves; and others of lesser Note, too many to be here enumerated.

The Orders of Knighthood are two; 1. the *Knights of the Bath*, first created by King *Henry IV*, 1399. 2. The *Knight of the Garter*, which is the chief Order of *England* begun 1350, being founded by King *Edward III*.

OF SCOTLAND.

Scotland is divided from *England* by the River *Tweed* Southwards. It has the *German Ocean* on the East; the *Irish Sea*, and the *Western Isles* on the West; and the *Deucaledonian Sea*, with the *Orcades* on the North. As for the Dimensions of the Kingdom in general comprehending the Islands (of which there are in the *Western Sea* about 300) it is not much less than *England*, and according to modern Geographers about 315 Miles long, but not above 190 broad.

The whole Kingdom is divided by the River *Tay*, into the South and North Parts; the South Part whereof is most populous and civilized, and better cultivated than the North Part; the latter still retaining the Customs and Manners of the ancient *Irish*.

The Territories or Counties in the South of *Scotland*, are distinguished into 1. *Tiviotdale*, 2. *March*, 3. *Lauderdale*, 4. *Liddesdale*, 5. *Esfordale*, 6. *Anandale*, 7. *Niddesdale*, 8. *Galloway*, 9. *Carrick*, 10. *Kyle*, 11. *Cunningham*, 12. *Arran*, 13. *Chaesdale*, 14. *Lenox*, 15. *Stirling*, 16. *Fife*, 17. *Strathern*, 18. *Monteith*, 19. *Argyle*, 20. *Cantire*, and 21. *Lorne*.

The most remarkable Things in the South of *Scotland* are, 1. *Edinburgh*, the capital City in the whole Kingdom, where there is an University, and a strong Castle; 2. *St. Andrew's*, near the North Sea, which has a good Harbour, University, and Archbishoprick; 3. *Glasgow*, famous for its University, and its pleasant Situation.

In the North of *Scotland* there are 13 Counties; the Capital City is *Aberdeen*. The different Names of the Counties in the North Part of *Scotland* are, 1. *Lochabar*, 2. *Broadalbin*, 3. *Perth*, 4. *Atbol*, 5. *Angus*, 6. *Merns*, 7. *Mar*, 8. *Buchan*, 9. *Murrey*, 10. *Ross*, 11. *Sutherland*, 12. *Caithness*, and 13. *Strathnaver*.

These are again divided into Sheriffdoms, Stewardships, and Bailiwicks, which were inherited, for the most part, by noble and ancient Families. But this Constitution is lately alter'd by Act of Parliament.

The principal Rivers in *Scotland* are the *Tweed*, *Clyde*, *Tay* and *Spay*, all navigable; besides many Lakes, of which *Lomund* and *Nefs* are the most remarkable; there are innumerable

merable Creeks and Bays, which afford many safe Harbours convenient for Trade and Fishing.

The most noted Harbours about *Scotland* are 1. *Leith*, 2. *St. Andrews*, 3. *Dundee*, and 4. *Montrose*. *Scotland* in general abounds with Corn, Cattle, Fowl, Fish, Wood, Coals, Salt, Rivers, Fountains, and all Things not only necessary for the Use of the Inhabitants, but sufficient to drive a considerable Trade with other Nations; there being yearly exported vast Quantities of Fish, Corn, Coals, Hides, Tallow and Linen Cloth. There are Lead and Iron Mines in Abundance, and, as some affirm, there are Gold and Silver Mines amongst them. The Air is sharper but more pure than that in *England*.

The *Scots* have sufficiently shewn their Valour in the World, particularly by their Behaviour in struggling for their Liberties. The Nobility and Gentry of *Scotland* are great Lovers of Learning; they frequent not only their own Universities, but also those of *England*, *France*, and other Countries. The Men in general are well made, and of a robust hale Constitution.

The Religion which prevails in *Scotland* is the *Protestant*. They are divided however as they are in *England*, with this Difference, that those who dissent from the Church of *England*, and are called *Presbyterians*, are in much greater Number than the Churchmen; so that *Presbyterianism* is the established Religion of the Country. There are, however, two Archbishops, the Archbishop of *St. Andrew's*, Primate and Metropolitan of all *Scotland*; and the Archbishop of *Glasgow*, who is also Metropolitan; under the former are eight, and under the latter are four Bishops.

The Government in *Scotland*, before the Union, which was established in *Queen Ann's* Reign, was supported; like that of *England*, by King and Parliament, which was called together at *Edinburgh*; at present they are limited to 16 Peers and 45 Commoners, to sit in the *British* Parliament at *Westminster* according to the Union Act, which subjects both Kingdoms to the same Government.

The *Scotch* Islands are the Isles of *Orkney*, which lie Northwards, and are 28 in Number; *Pomana*, the best, has a Bishop's See. 2. The Isles of *Shetland*, 68 in Number, not very fruitful. 3. The Western Isles are 16 in Number, but of no great Importance.

The *Scotch* Order of Knighthood is that of *St. Andrew*, instituted by *Achaius* King of *Scotland*. The Collar, at which hangs the Image of that Saint, imitates Thistles and Rue, denoting that the one is not touched without Hurt, and the other is an Antidote against Poison.

Of the Kingdom of IRELAND.

IRELAND was probably so called from the Word *Hiere*, which in the *Irish* Language signifies West, or Western Coast, because this Country lies farther Westwards than any Country in *Europe*. It is a pretty large Island; in Length near 270 *English* Miles, and in many Parts it is in Breadth about 155.

Eastward, it is opposite to *England*: *Westward*, to the *Irish Seas*; *Southward* to the *Atlantic Ocean*; and *Northward*, to the *Scotish Sea*. It is divided into four Capital Provinces, viz. 1. *Munster*, 2. *Leinster*, 3. *Connaught*, and 4. *Ulster*.

MUNSTER, is divided into six Counties, viz. 1. *Kerry*, 2. *Cork*, 3. *Waterford*, 4. *Tipperary*, 5. *Limerick*, and 6. *Clare*.

LEINSTER is divided into twelve Counties, viz. 1. *East-Meath*, 2. *West-Meath*, 3. *Louth*, 4. *Longford*, 5. *King's County*, 6. *Queen's County*, 7. *Catherlough*, 8. *Kilkenny*, 9. *Kildare*, 10. *Waxford*, 11. *Wicklow*, and 12. *Dublin*.

CONNAUGHT is divided into five Counties, viz. 1. *Sligo*, 2. *Leitrim*, 3. *Roscommon*, 4. *Galway*, and 5. *Mayo*.

ULSTER is divided into nine Counties, viz. 1. *Antrim*, 2. *Down*, 3. *Armagh*, 4. *Londonderry*, 5. *Savan*, 6. *Donnegal*, 7. *Fermenagh*, 8. *Tyrone*, and 9. *Manoghan*.

There are seven Cities in this Kingdom; whereof in *Munster* are four, viz. 1. *Cashel* in the County of *Tipperary*, an Archbishoprick and walled Town, noted for the great Rock, called *St. Patrick's Rock*, whereon stands the Cathedral, to which there is Access only by one narrow Foot-Way, hewn on the Side of the Rock, which is walled in, and is a strong Place of Defence. 2. *Cork* a large City and noted Harbour on the South Coast, is a Bishop's See likewise. 3. *Limerick*, another Seaport on the West Coast, strongly fortified by Art and Nature; that Part called the *English Town*, being encompassed by the River *Shannon*; this is likewise a Bishop's See. 4. *Waterford*, a fine Harbour and Bishop's See. In *Leinster* are two Cities, viz.

1. *Dublin*, the Metropolis of the Kingdom, a large Seaport and of great Trade, has an University, and is an Archbishopric. 2. *Kilkenny*, an inland Town, finely situated on the River *Nuor*, is a Bishop's See under the Title of *Leighlin* and *Ferns*. In *Ulster* is one City, viz. *Londonderry*, a strong Town, famous for its holding out a long Siege against the late King *James's* Army in the *Irish* Wars. Besides these Cities, there are a great many Towns of Note both on the Coasts and Inland.

In *Ulster* is likewise the Town of *Armagh*, the Metropolitan Archbishopric, and Primacy of all *Ireland*; and in *Connaught* is *Tuam*, another Archbishoprick, and under these four are eighteen Bishops, who preside over the inferior Clergy.

The most noted Rivers in *Ireland* are the *Shannon*, which is the principal River in the whole Country, and empties itself into the Western Ocean. 2. The *Barrow*. 3. The *Sewer*. 4. The *Boyne*, which flows by *Drogheda*, and empties itself into the *Irish* Sea. And 5. The *Nuor*, which last, with the *Sewer* and *Barrow*, all join together near *Waterford*, and fall into the Sea, besides many other small Rivers. The Country abounds with Lakes or Loughs.

The Commodities of *Ireland* consist chiefly in Cattle; the Air is mild, but moist and foggy; the Soil is not very proper for Corn, it being always poor, and it never ripens to Perfection. The Pasture is rich in some, and but indifferent in other Places, but altogether it is a fine Country, and capable of Improvements; and the People are free from being annoyed by any venomous Creatures, since none ever harbour or breed there.

A certain Author gives the following Description of the *Irish*, "They are (says he) a strong and bold People, martial and prodigal in War, nimble, stout, and courageous, careless of Life, but greedy of Glory; courteous, to Strangers, constant in Love, light of Belief, impatient of Injury, given to Lasciviousness, and in Enmity implacable." But as most Writers are partial in their Characters of Countries, according as they stand affected towards them, there is no relying on the bare Report of a single Author in such Cases.

The greatest Part of the Natives are *Roman Catholicks*, but as the Laws have been put in Execution for establishing the Church of *England* in that Kingdom, it has already and

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and will in Time lessen the Number of the *Papists*, and increase that of the *Protestants*.

Ireland belongs to the Crown of *Great-Britain*, and is govern'd by a Lord Lieutenant, who acts in the Name, and by the Authority of the King.

The other Countries which belong to the Crown of *Great-Britain*, in *Europe*, are the *Isles of Man*, *Jersey*, *Guernsey*, *Gibraltar*, *Minorca*, and formerly *Majorca*. Though with regard to the *Isle of Man*, it has, Time out of Mind, been an hereditary Royalty, or Principality, in the *Stanley* Family, Earls of *Derby*, and is now descended, by Marriage, to his Grace the Duke of *Atbol*, a Peer of *North-Britain*.

In *Asia*, several small Islands, besides the Settlements and Factories in *India*, viz. *Bengal*, *Fort St. George*, &c.

In *Africa*, some Part of *Guinea*, also the Island *St. Helena*, now enjoyed by the *East-India* Company.

In *America*; *Carolina*, *Georgia*, *Jamaica*, *Virginia*, *New-England*, *New-York*, *New-Jersey*, *Pensilvania*, *Maryland*, and several of the *Caribbee* Islands, as *Antigua*, *Barbadoes*, *Nevis*, *Bermudas*, *St. Christophers*, &c.



Of PLAIN TRIGONOMETRY;

O R,

The Resolution of Right-lined Triangles.

A Right-lined Triangle is a Figure contained between three right Lines, which at their Meeting make three Angles. Some call it a *plain Triangle*. If one of these Angles is a *right Angle*, that is, if one of these Lines stand perpendicular to another, it is called a *right-angled Triangle*. But if none of them are right, it is called an *oblique-angled Triangle*, and if one of these Angles is *obtuse*, that is, greater than a right Angle, it is called an *obtuse-angled Triangle*. But if all the Angles are acute, that is, less than right Angles, it is called an *acute-angled Triangle*.

In

In the right-lined Triangle ABC, the longest Side AC is called the *Hypotenuse*, and the other two Sides the Legs; likewise AB is called the Base, because the Triangle seems to stand upon it, and BC the Perpendicular. And because BC is perpendicular to AB, it is a *right-angled Triangle*.

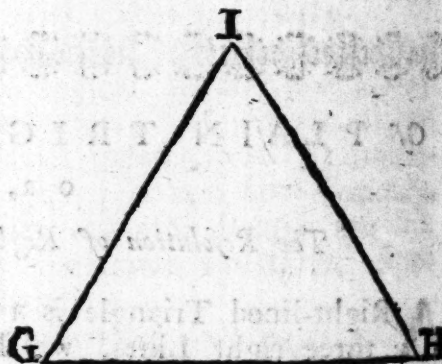
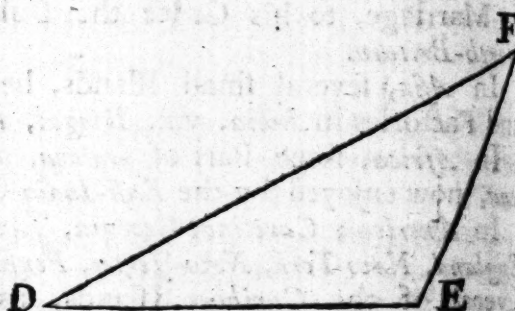
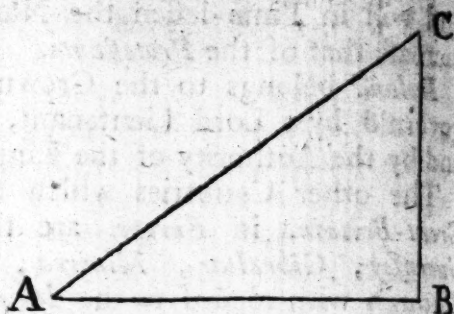
The Triangle DEF is an *oblique-angled Triangle*. It is likewise called an *obtuse-angled Triangle*, because the Angle at E is greater than a right Angle. Likewise, as all the three Sides are unequal, it is called a *Scalenum*.

The Triangle GHI is an *acute-angled Triangle*, because every Angle is less than a right one; it is also an *Equilateral Triangle*, because all the Sides are equal.

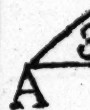
The Triangle KLM is called an *Isoceles*, because two of the Sides only are equal; as KM is equal to LM.

It is necessary to observe, that all the Angles of every plain Triangle are equal to two right ones, that is, to twice 90 or 180 Degrees.

All Triangles are solved by the Rule of Proportion, in which three known Numbers are



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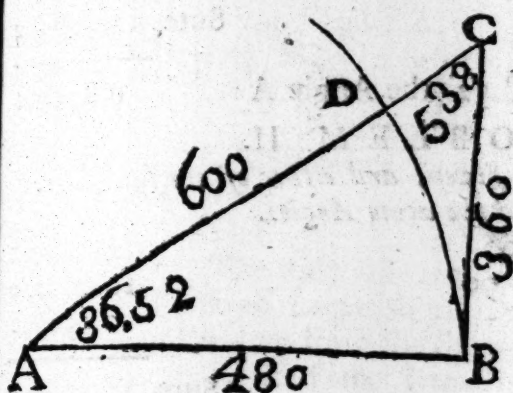
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are given, so that you are to multiply the two last, and divide by the first, in order to find the Number sought. But this is much easier performed by Logarithms of natural Numbers, Sines, and Tangents, in which you have nothing to do but add the two last together, and subtract the first, by which Means you will have the fourth.



We call the Sine, Tangent, and Secant of an Angle, the Sine, Tangent, and Secant of the Arch which measures that Angle. And in every right-lined Triangle, such as ABC, the Sides are in the same Proportion one to another as the Sines of the op-

posite Angles. For having taken A as the Centre, with the Line AB for the Radius, and having described the Arch DB, you will find that half of the Chord BD is half the Sine of the Angle at A. The same will hold good if you take B or C for the Centre.

Whence it follows, that in every Triangle, ABC, the Sine of the Angle A is to the opposite Side BC, as the Sine of the Angle B is to the opposite Side AC, or as the Sine of the Angle C is to the Sine of its opposite Side AB.

Likewise in every Triangle ABC, which is right-angled, suppose at B; if you take the Leg AB for the Radius of a Circle, or the total Sine, the other Leg, BC, will be the Tangent of the Angle A; and AC will be the Secant of the same Angle.

In the Resolution of a Triangle we ought to know as many Sides and Angles as are necessary to determine the Triangle, in such a Manner that we shall not be able to change them without changing one of the other Angles or known Sides. In all these Operations add the two last Lines together, and subtract the first; unless you take the arithmetical Compass of the first, and then add them all together.

Of PLAIN TRIGONOMETRY.

PROBLEM I.

The Legs being given, to find the acute Angles.

As the Leg AB 480

2.681241

Is to the Leg BC 360

2.556302

So is the Radius or Sine of 90°

10.000000

Sum 12.556302

To the Tangent of $36^\circ 52'$ the Angle A

9.875061

PROBLEM II.

The Hypothenufe being given, and either of the said Legs, to find the acute Angles.

As the Hypothenufe 600

2.778151

To the Radius or Sine 90°

10.000000

So is the Leg BC 360

2.556302

Sum 12.556302

To the Sine of the Angle at A $36^\circ 52'$

9.778151

Note, When you have found one of the acute Angles, substract it from 60° , and the Remainder will be the other acute Angle.

PROBLEM III.

*The Angles and either of the Legs being given, to find the other Leg.*As the Sine of 90°

10.000000

To the given Leg BC, 360

2.556302

So the Tangent of the acute Angle next the
given Side C }

10.124939

To the Leg sought, 480

2.681241

PROBLEM IV.

*The Angles and the Hypothenufe being given, to find either of the Legs.*As the Sine of 90° , the Radius

10.000000

To the Hypothenufe

2.778151

So is the Sine of the Angle opposite the Leg sought

9.778851

To the Leg sought, 360

2.557062

PRO-

PROBLEM V.

The Hypothenuse and either of the Legs being given, to find the other Leg.

Add the Logarithm of the Sum of the Hypothenuse, and the given Leg, to the Logarithm of their Difference, and the half of the Sum of the Logarithms is the Logarithm of the Leg sought, thus :

The Hypothenuse 600

The Leg BC 360

Sum 960 2.982271

Difference 240 2.380211

5.362482 Sum

The Side AB 480 2.681241 half

Or if a Table of Logarithms is not at hand, subtract the Square of the Leg from the Square of the Hypothenuse, and the Square Root of the Remainder is the Measure of the other Leg, thus :

The Square of 600 is 360000

of 360 is 129600

Remainder 930400

The Square Root of which is 480 as before.

Note, If the Sides of the Triangle are 60, 48, and 36, or any Numbers under 200, this Question may be readily answered by the Table of square Numbers inserted in this Book. Thus,

The Hypothenuse and a Leg being given to find the other Leg.

The Square of 60 is 3600

of 48 is 2304

Remainder 1296

Root 36

The Square of 60 is 3600

of 36 is 1296

Remainder 2304

Root 48

252 Of PLAIN TRIGONOMETRY.

To find the Hypothenuſe,

$$\begin{array}{r} \text{The Square of } 48 \text{ } 2304 \\ \hline \text{of } 36 \text{ } 1296 \end{array}$$

$$\begin{array}{r} \text{Sum } 3600 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Root } 600 \\ \hline \end{array}$$

These Rules will hold univerſally in all right-angled Triangles,

PROBLEM VI.

The Angles being given, and either of the Legs, to find the Hypothenuſe.

As the Radius or Sine of 90°	10.000000
To the given Leg 360	2.556302
So is the Secant of the Angle next the given } Leg $53^\circ 8'$	10.221849

To the Hypothenuſe 600	2.778151
------------------------	----------

Note, To find the Secant of an Angle, ſubſtract the Sine Complement of the ſaid Angle from 20.000000, the double Radius, and the Remainder will be the Secant ſought. Thus from

$$\begin{array}{r} 20.000000 \\ \text{Subſtract } 9.1778151 \text{ the Sine of } 36^\circ 52' \\ \hline \end{array}$$

The Remainder 10.221849 is the Secant of $53^\circ 8'$ ſought.

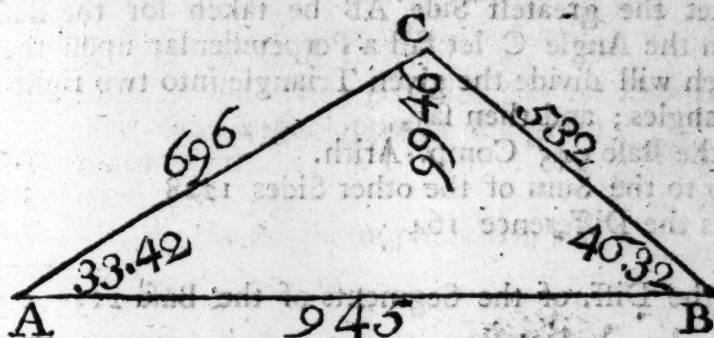
Of Oblique-angled Plain Triangles.

PROBLEM I.

Two Sides and the Angle oppoſite to either of them being given, to find the other oppoſite Angle.

It is neceſſary to know whether the Angle given be Obtufe or Acute. Thus the Angle at C may readily be perceived to be Obtufe, and conſequently the other two muſt be Acute. Likewise when an Obtufe Angle is given the Supplement to 180 muſt be taken.

As



As the Side AC 696 Comp. Arith. 7.157391
 To the Sine of the Angle B $46^{\circ} 32'$ 9.860802
 So is the Side BC 532 2.725911

To the Sine of the Angle A $33^{\circ} 42'$ 9.744104

PROBLEM II.

Two Sides and the Angle included between them being given, to find the other Angles.

As the Sum of the two Sides AC and BC 1228 6.910802
 To the Difference of the same 164 2.214843
 So the Tangent of half the Sum of the Angles } 9.925609
 fought $40^{\circ} 7'$

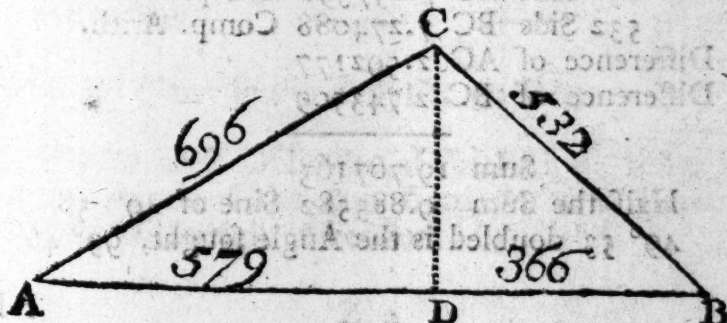
To the Tangent of the Difference $6^{\circ} 25'$ 9.051254

The Angle at C is $99^{\circ} 46'$, the Supplement of which to 180 is $80^{\circ} 14'$, which is the Sum of the two remaining Angles. The half of this Sum is $40^{\circ} 7'$, as above.

Now if you add this Difference $6^{\circ} 25'$ to $40^{\circ} 7'$ the Sum is $46^{\circ} 32'$, the greater Angle. And if you subtract it from $40^{\circ} 7'$ the Remainder is the lesser Angle $33^{\circ} 42'$.

PROBLEM III.

The three Sides being given, to find any of the Angles.



Z

Let

Let the greatest Side AB be taken for the Base, and from the Angle C let fall a Perpendicular upon the Base; which will divide the given Triangle into two right-angled Triangles; and then say,

As the Base 945	Comp. Arith.	7.024568
Is to the Sum of the other Sides 1228		3.089198
So is the Difference 164		2.214844

To the Diff. of the Segments of the Base 213	2 328610
--	----------

Subtract 213, the Difference found, from the Base 945, and the Remainder will be 732, the half of which is 366, which measures the Segment DB. The other half added to 213 makes 579 for the other Segment; so that you have two right-angled Triangles, of each of which a Leg and the Hypotenuse are known, which may be solved by the second Problem of the right-angled Triangles aforegoing.

Or you may add all the given Sides together, and from half the Sum subtract the Sides that the Angle sought lies between to gain their Difference. Then add the Complement Arithmetical of the Logarithms which comprehend the Angle, to the Logarithm of the Differences, and half the Sum will be the Logarithm of the Sine of half the Angle sought. Thus,

AB	945
AC	696
BC	532

Sum 2173

Half 1086½

Difference of AC 390

of BC 554

Logarithms.

696 Side AC 7.157391 Comp. Arith.

532 Side BC 7.274088 Comp. Arith.

Difference of AC 2.592177

Difference of BC 2.743509

Sum 19.767165

Half the Sum 9.883582 Sine of 49° 58'

49° 53' doubled is the Angle sought, 99° 46'

PROBLEM V.

The Angles and one Side being given, to find the other Sides.

As the Sine of the Angle opposite the given
Side Comp. Arith. $\left\{ \begin{array}{l} 0.255028 \\ 2.725911 \end{array} \right.$

To the given Side 532 $\left\{ \begin{array}{l} 2.725911 \\ 9.871996 \end{array} \right.$

So is the Sine of the Angle opposite the Side
sought $46^{\circ} 33'$ $\left\{ \begin{array}{l} 9.871996 \\ 2.842935 \end{array} \right.$

To the Side sought 696 $\left\{ \begin{array}{l} 2.842935 \end{array} \right.$



ASTRONOMICAL QUESTIONS.

I. **T**HE greatest Obliquity of the Ecliptic being given, and the Distance of the Sun from the next Equinoctial Point to find his Declination. Suppose the Sun to be in 0 Degree of *Taurus*, then he will be 30 Degrees from the Equinoctial Point, which is the Beginning of *Aries*, and the greatest Declination or Obliquity of the Ecliptic to be 23 Degrees 29 Minutes. Then say,

As the Radius or Sine of 90 Degrees 10.000000

Is to the Sine of 30 Degrees 9.698970

So is the Sine of 23 Degrees 29 Min. 9.600409

To the Sine of present Declinat. 11 Deg. 30 Min. 9.299379

II. The greatest Declination being given, and the present Declination, to find the Sun's Place in the Ecliptic.

As the Sine of the greatest Declin. Comp. Arith. 0.399591

To the Sine of the present Declin. $11^{\circ} 30'$ 9.299379

So is the Radius 10.000000

To the Sun's Place in the Ecliptic, 30 Deg. 9.698970

III. The greatest Obliquity of the Ecliptic being given, and the Distance of the Sun from the next Equinoctial Point, to find his right Ascension.

256 ASTRONOMICAL QUESTIONS;

As the Radius $\frac{\text{---}}{\text{---}}$ 10.000000
 To the Sine Complement of the greatest }
 Obliquity $3^{\circ} 29'$ } 9.963243
 So is the Tangent of the Sun's Distance from }
Aries 30° } 9.761439

To the Tangent of the right Ascension $27^{\circ} 54'$ 9.723892

IV. The greatest Obliquity of the Ecliptic and the Declination of the Sun being given, to find his right Ascension.

As the Radius $\frac{\text{---}}{\text{---}}$ 10.000000
 To the Tangent of the Sun's Declin. $11^{\circ} 31'$ 9.301462
 So is the Tangent Com. of the greatest Obl. 10.362044

To the Sine of the Sun's right Ascension $27^{\circ} 54'$ 9.670506

V. The greatest Obliquity of the Ecliptic, and the Distance of the Sun from the next Equinoctial Point, being given, to find the Angle the Ecliptic makes with the Meridian.

As the Radius $\frac{\text{---}}{\text{---}}$ 10.000000
 To the Sine Comp. of the Sun's Distance }
 from the next Equinoctial Point, } 9.937531
 So is the Tangent of the greatest Obliquity of }
 the Ecliptic } 9.637956

To the Tangent Complement of the Angle }
 sought, $69^{\circ} 23'$ } 9.575487

VI. The Sun's greatest Declination being given, and his present Declination, to find the Angle which the Ecliptic makes with the Meridian.

As the Sine Comp. of the Declination of the }
 Sun $11^{\circ} 30'$ Comp. Arith. } 0.008807
 To the Sine Comp. of the greatest Obliquity }
 $23^{\circ} 29'$ } 9.962452
 So the Radius $\frac{\text{---}}{\text{---}}$ 10.000000

To the Line of the Angle sought $69^{\circ} 23'$ 9.971259

VII. The

VII. The Elevation of the Pole being given, and the Declination of the Sun, to find the Amplitude of the Sun ortive or occafive.

As the Sine Comp. of the Elev. of the Pole } 0.205851
 $51^{\circ} 30'$ Comp. Arith.

To the Sine of Declination of the Sun $11^{\circ} 30'$ } 9.299379
 So is the Radius } 10.000000

To the Sine of the Amplitude fought $18^{\circ} 40'$ } 9.505230

Note, The Amplitude of the Sun ortive or occafive, that is, when he rifes or fets, is towards the North when the Sun is in the fixth Northern Signs, *Aries, Taurus, Gemini, Cancer, Leo, Virgo.* Towards the South when he is in the Southern Signs, *Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces.*

To find the Sun's greatest Amplitude proceed as before,
 As the Sine Complement of the Elevation of } 0.205851
 the Pole Comp. Arith.

To the Sine of the Sun's greatest Declination } 9.600409
 So is the Radius } 10.000000

To the Sine of the greatest Amplitude $39^{\circ} 48'$ } 9.806260

VIII. The Sun's greatest Amplitude, and his Distance from the next Equinoctial Point being given, to find the present Amplitude.

As the Radius } 10.000000

To the Sine of the Sun's greatest Amplitude } 9.806260
 $39^{\circ} 48'$

So is the Sine of the Sun's Distance from the } 9.698970
 Equinoctial 30°

To the Sine of the Amplitude fought, $18^{\circ} 40'$ } 9.505230

IX. The Declination of the Sun and the Elevation of the Pole being given, to find the ascensional Difference.

As the Radius or Sine of 90 Degr. } 10.000000

To the Tangent of the Sun's Declin. $11^{\circ} 30'$ } 9.308463

So is the Tang. of the Elev. of the Pole $51^{\circ} 30'$ } 10.099395

To the Sine of the ascensional Difference. 14.49 } 9.407858

The

The ascensional Difference being converted into Time by a Table made for that Purpose, and substracted from six Hours when the Sun is in the Northern Signs, and added to six Hours when the Sun is in the Southern Signs, will give the Time of his Rising. Thus $14^{\circ} 40'$ turned into Time make 59 Minutes, which substracted from 6 Hours, leave 5 Hours 1 Minute, the Time of the Sun's Rising, and added to 6 give 6 Hours 59 Minutes, the Time of his Setting. Likewise the Time of the Setting being doubled will give the Length of Day; thus twice 6 Hours, 59 Minutes, make 13 Hours 68 Minutes, the Length of the Day.

X. The Declination of the Sun being given, and the Elevation of the Pole, to find the Time of the Sun's Rising and Setting.

As the Radius ————— 10.000000

To the Tangent of the Sun's Declin. $11^{\circ} 30'$ 9.308463

So is the Tangent of the Elevation of the } 10.099395
Pole $51^{\circ} 30'$

To the Sine Complement of the seminoc- } 9.407858
turnal Arch, $75^{\circ} 11'$

This converted into Time, gives 5 Hours 1 Minute, the Time of the Sun's Rising, and substracted from 12 Hours, will be 6 Hours 59 Minutes, the Time of his Setting.

XI. The Elevation of the Pole, the Declination of the Sun, and the Hour of the Day being given, to find the Altitude or Height of the Sun.

As the Radius ————— 10.000000

To the Tangent Complement of the Eleva- } 9.900605
tion of the Pole $51^{\circ} 30'$

So the Sine Complement of the Distance of } 9.984944
the Sun from the Meridian 15 Degrees,
that is, 11 or 1 o'Clock

To the Tangent of the first Arch $37^{\circ} 32'$ 9.885549

Subtract the Declination of the Sun from 90 Degrees, and you will have the Distance of the Sun from the Pole. Then from 6 in the Morning to 6 in the Evening sub-

tract

ASTRONOMICAL QUESTIONS. 259

subtract the first Arch from the Sun's Distance from the Pole, and you will have the second Arch. Thus 90 Degrees.

Sun's Declination, 11 30

Distance from the Pole, 78 30

The first Arch, 37 32

The second Arch, 40 58

Then say,

As the Sine Complement of the first Arch } 0.100727
found Comp. Arith.

To the Sine Complement of the second Arch 9.877999
So is the Sine of the Latitude $51^{\circ} 30'$ 9.893544

To the Sine of the Altitude of the Sun $48^{\circ} 10'$ 9.872270

This may be obtained more readily thus,

As the Cosine of the Hour from the Meridian } 0.015056
 15° Comp. Arith.

To the Tangent of Latitude ——— 10.099395
So is the Radius ——— 10.000000

To the Tangent of the first Arch $52^{\circ} 28'$ 10.114451

When the Declination is North, subtract it from the first Arch found, and the Remainder shall be the second Arch. But when South, it must be added to make the second Arch.

First Arch 52° 28'
Declination 11° 30'

Second Arch 40° 58'

As the Sine of the first Arch Co. Ar. $52^{\circ} 28'$ 0.100727

To the Cosine of the Second Arch $40^{\circ} 58'$ 9.877999

So is the Sine of the Latitude $51^{\circ} 30'$ 9.893544

To the Sine of the Altitude of the Sun $48^{\circ} 10'$ 9.872261

There is a more compendious and universal Way, which is less liable to Error; thus: Add the three Logarithms together, of the Sine Complement of the Height of the Pole, the Sine Complement of the Declination of the Sun,

Sun, and the Sine Complement of the Distance of the Hour from the Meridian. Afterwards add together the Sine of the Height of the Pole, and the Sine of the Declination of the Sun, then neglecting the Radius's, subtract the least Sum from the greater; the Remainder will be a Logarithm to be sought for among those of the natural Numbers. But you must neglect the Characteristic, and look for it among the highest Numbers, in order to have Decimals. The following Example will make the Matter plain.

Sine Complement of the Height of the Pole	9.794149
Sine Complement of the Declination of the Sun	9.991193
Sine Complement of the Hour 15°	9.984949

First Sum 0.770291

Least Sum 9.193199

Difference 0.577092

S. of the Pole's Height 9.903544

S. of the Sun's Decl. 9.299655

Least Sum 9.193199

Now as you see the Characteristic of the Remainder is 0, the natural Number answering thereto must be under 10. Therefore I look for the Logarithm among the highest Numbers, and I find it to be 3.7765. That is 3, is the Integer, and the rest are decimal Fractions. Now as the Declination is North, I add 1 to the Integer; if South, I should have subtracted one from it; and then it will stand thus, 4.7765. The Logarithm answering to this Number is 0.679101. To which I add the least Sum, which is the Sine of the Altitude sought.

0.679101

9.193199

9.872300

48.11

Suppose the Declination had been South, I should have taken one from the Integer 3.7765 and then it would have been, 2.7765 to which the corresponding Logarithm is 0.443498, which add to the least Sum, and it will make 9.636627 the Sine of $25^{\circ} 40'$, when the Sun is in the Beginning of *Scorpio*.

ASTRONOMICAL QUESTIONS. 261

XII. To find the Height of the Sun at the Hour of six.

As the Radius $\frac{\text{---}}{\text{---}}$ 10.000000
 To the Sine of the Sun's Declination $11^{\circ} 30'$ 9.299655
 So is the Sine of the Height of the Pole $51^{\circ} 30'$ 9.893544

To the Sine of the Sun's Height at six $8^{\circ} 58'$ 9.193199

XIII. To find the Height of the Sun when he is in the Equator.

As the Radius $\frac{\text{---}}{\text{---}}$ 10.000000
 To the Cosine of the Height of the Pole $51^{\circ} 30'$ 9.794149
 So is the Cosine of the Sun from Merid. 15° 9.984944

To the Sine of the Altitude sought $36^{\circ} 58'$ 9.779093

XIV. The Latitude of the Place, and the Declination of the Sun being given, to find the Time when the Sun comes to be due East or West.

As the Tangent of the Latitude $51^{\circ} 30'$ Co. Ar. 0.900605
 Is to the Tangent of the Declination $11^{\circ} 30'$ 9.308463
 So is the Radius $\frac{\text{---}}{\text{---}}$ 10.000000

To the Cosine of the Hour $80^{\circ} 41'$ 9.209068

This converted into Time is 5 Hours, 23 Minutes from Noon.

XV. The Latitude of the Place, and the Declination of the Sun being given, to find his Azimuth at six o'Clock.

As the Radius $\frac{\text{---}}{\text{---}}$ 10.000000
 To the Cosine of the Latitude $51^{\circ} 30'$ 9.794149
 So is the Tangent of the Declination $11^{\circ} 30'$ 9.308463

To the Co. Tang. of the Azim. sought $82^{\circ} 43'$ 9.102612

XVI. The Hour of the Day, the Sun's Altitude and his Declination being given, to find his Azimuth.

As the Sine of the Sun's Altitude $48^{\circ} 10'$ Co. Ar. 0.175896
 Is to the Sine of 15 Deg. the Hour 9.412996
 So is the Cosine of the Sun's Declination $11^{\circ} 30'$ 9.991193

To Sine of Sun's Azim. from the South $22^{\circ} 21'$ 9.580085

XVII. The

XVII. The Azimuth, the Altitude, and the Declination of the Sun being given, to find the Hour of the Day.

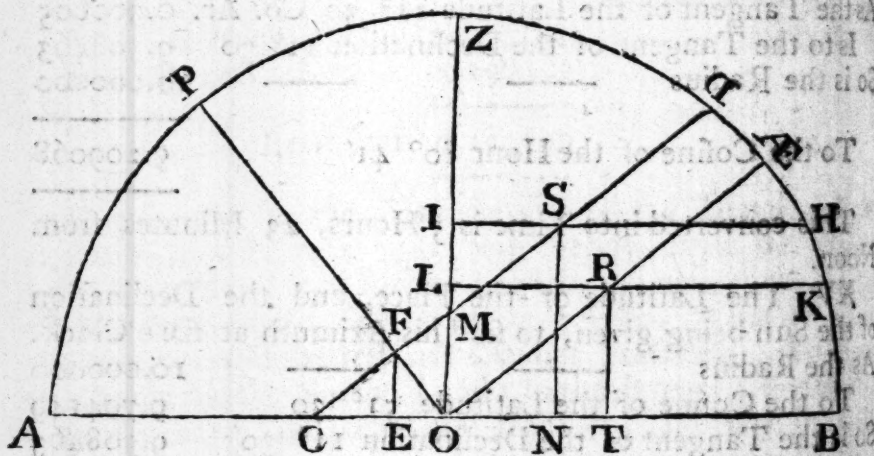
As the Cosine of $11^{\circ} 30'$ the Declin. Co. Ar. 0.008807
 To the Sine of the Azimuth $22^{\circ} 21'$ 9.580085
 So is the Sine of $48^{\circ} 10'$ the Altitude. 9.824104

To the Sine of the Hour 15° or 1 from Noon 9.412996

XVIII. The Latitude of the Place, and the Sun's Declination being given, to find his Altitude when he is due East or West.

As the Sine of the Latitude $51^{\circ} 30'$ Co. Arith. 0.106456
 To the Radius or Sine of 90° Deg. 10.000000
 So is the Sine of the Declination $11^{\circ} 30'$ 9.299695

To Sine of Alt. when due East or West $14^{\circ} 46'$ 9.406151



To make these Matters more plain, take AO the Radius from 60 in a Line of Chords, or 90 in a Line of Sines and describe the Semi-circle AZB. Then take $38^{\circ} 30'$ the Height of the Equator or Complement of the Latitude of London, from the Line of Chords, and set it off from B to $\mathcal{A}$, and draw the Line from $\mathcal{A}$ to O the Center, and that will represent the half Equator above the Earth. But I should have mentioned first, that the Semi-circle represents the Meridian of twelve o'Clock; that BZ is the South Part, AZ the North; that the Perpendicular raised from O to Z is the East, and that PO at right Angles with $\mathcal{A}$ EO is half of

of the Axis of the World, and the Hour Line of six o'Clock; that P is the North Pole, and Z the Zenith, or Point directly over our Heads. These things being known, take $11^{\circ} 30'$ the Declination of 0 Degree of *Taurus*, and place it from $\mathcal{A}$ to D. And the same from the Line of Sines of the same Radius, and set it off from O to F on the Line of six o'Clock. Draw a Line from D through F till it reaches C, on the Diameter, which is the Point where the Sun sets in the Horizon AB. In this Line the Sun must necessarily be while he continues in 0° of *Taurus*. Now for Distinction sake let the Hour be four o'Clock in the Afternoon, which is 60° from D, or 30° from PO the Hour of six. I therefore take 30° from the Line of Sines and place it from F to S, which represents the place of the Sun. But as DC is part of a lesser Circle of the Sphere, I make FD the Radius, by means of a Sector, before I can measure 30° properly. I likewise take 30° from the Line of Sines with the common Radius, and place it from O to R. This Point will represent the Place of the Sun at four o'Clock, when he is in the Equator, the Beginning of *Aries*. Now observe that,

CF is the Sine of the ascensional Difference, $14^{\circ} 49'$.

CO is the Sine of the Sun's Amplitude $18^{\circ} 40'$.

FE a Perpendicular, let fall from F to E, is the Sun's Height at six o'Clock $80^{\circ} 58'$.

CD $104^{\circ} 49'$ is the Sun's Diurnal Arch, the Supplement of which to 180 is $75^{\circ} 11'$ the Seminocturnal Arch.

EO is equal to the Sun's Azimuth, at six o'Clock $7^{\circ} 17'$.

DM is the Distance from the Meridian when he is due East $80^{\circ} 41'$, which turned into time at 15 Degrees for an Hour, and a Degree for four Minutes, is 5 Hours, 23 Minutes.

SN is the Sine of the Sun's Altitude $27^{\circ} 28'$.

IS is the Sine of the Sun's Azimuth from the East $17^{\circ} 3'$,

IH being the Radius, and $72^{\circ} 57'$ his Azimuth from the South.

RT is the Sine of the Sun's Altitude at four o'Clock in the Equator.

LR is the Sine of the Sun's Azimuth from the East, when in the Equator as above, $24^{\circ} 20'$.

Note,

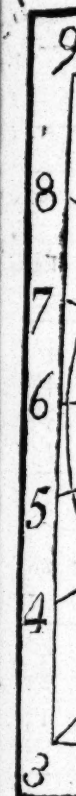
Note, This Scheme is drawn according to the orthographic projection of the Sphere, wherein all Circles perpendicular to the Eye are projected into right Lines. Hence all these Lines are measured by a Line of Sines, and the outward Circle itself by a Line of Chords. Likewise it is necessary to observe, that if you have occasion to draw a Line from $\mathcal{A}$ to R , 60° in the Equator or any other Circle projected into a Line, it will be best to take 30 Deg. the Complement, and set it off from O to R , because the Divisions of the Sines are much more distinct about the Middle of the Circle.



Of DIALING.

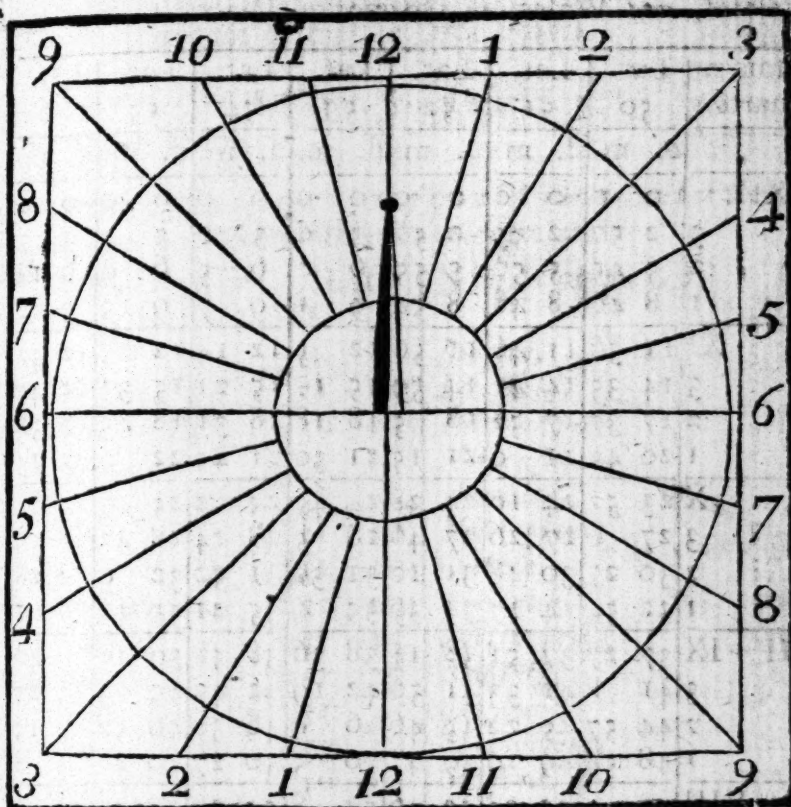
THE plainest and simplest of all is the EQUINOCTIAL DIAL, so called, because it is always to be placed parallel to the plane of the Equator, to which Circle when the Sun comes, the Days and Nights are equal throughout the World; except under the Pole where their Day continues half a Year. This Dial is particularly calculated for the Inhabitants of those Parts, if any, because it has 24 Hours placed thereon, which is of singular Advantage, for those Places where the Sun never sets for six Months together. In making this you need only divide a Circle into 15 Degrees for every Hour, $7^\circ 30'$ for half an Hour, and $3^\circ 40'$ for a Quarter. The Gnomon or Style is a straight Pin or Wire of any Length, placed in the Centre, and perpendicular to the Plane.

This Dial may be used in those parts of the World, by placing the Plane of the Dial parallel to the Plane of the Equator, and making the upright Gnomon to point exactly to the North Pole; but it is hardly worth while there being others more suitable to these Latitudes, and which may be placed with much less Trouble; especially as it is only fit for the Summer half Year.



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An EQUINOCTIAL DIAL.



To make an HORIZONTAL DIAL.

An HORIZONTAL DIAL is that which is placed parallel to the Plane of the Horizon, and is to be fixed on a strong Post or Stone Pillar, where the Sun may shine on it at all Times of the Day, from his Rising to his Setting. Those that have Conveniency to place this, need no other, because it serves all the Purposes of any other Dial that can be made.

There are different Ways of constructing this Dial, and a great deal of Pains has been taken, to no Manner of Purpose, because the easiest and truest Way is by Arithmetical Calculation, and requires no other Instrument to form it but a Ruler on which a Line of Chords is placed.

A TABLE of the Distances of the Hours, Half Hours, and Quarters, for all the Degrees of Latitude in England, Ireland, and Wales, in Horizontal Dials.

Hours, Quarters		Lat. 50		Lat. 51		Lat. 52		Lat. 53		Lat. 54		Lat. 55		Lat. 56	
		d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.	d.	m.
	XII.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	3	2	50	2	55	2	57	3	0	3	2	3	4	3	7
2	2	5	45	5	50	5	55	6	0	6	5	6	9	6	14
3	1	8	40	8	48	8	54	9	1	9	7	9	15	9	22
I	XI	11	36	11	46	11	56	12	5	12	14	12	23	12	32
1	3	14	35	14	47	14	59	15	11	15	21	15	32	15	45
2	2	17	37	17	51	18	5	18	18	18	31	18	45	18	58
3	1	20	45	21	0	21	15	21	30	21	45	22	0	22	14
II	X	23	52	24	10	24	28	24	45	25	2	25	19	25	35
1	3	27	6	27	26	27	46	28	5	28	24	28	42	28	59
2	2	30	27	30	48	31	10	31	30	31	50	32	9	32	28
3	1	33	54	34	17	34	39	35	0	35	21	35	42	36	1
III	IX	37	27	37	51	38	14	38	36	38	58	39	19	39	40
1	3	41	8	41	33	41	56	42	19	42	42	43	3	43	23
2	2	44	57	45	22	45	46	46	9	46	30	46	52	47	13
3	1	48	54	49	19	49	42	50	5	50	27	40	48	51	8
IV	VIII	53	0	53	23	53	46	54	8	54	29	54	49	55	9
1	3	57	14	57	36	57	58	58	18	58	38	58	57	59	15
2	2	61	36	61	56	62	16	62	35	62	53	63	11	63	27
3	1	66	6	66	24	66	42	66	58	67	14	67	29	67	44
V	VII	70	43	70	59	71	13	71	27	71	41	71	53	72	5
1	3	75	27	75	39	75	50	76	1	76	11	76	21	76	31
2	2	80	15	80	23	80	31	80	38	80	45	80	52	80	59
3	1	85	7	85	11	85	15	85	19	85	22	85	25	85	29
	VI	90	0	90	0	90	0	90	0	90	0	90	0	90	0

This Table is very plain and easy; for suppose you were to make a Dial for the Latitude of 56° , then the Distance for the Hours 2 and 10 will be $25^{\circ} 35'$. The Distance for 2 and a Quarter will be $28^{\circ} 59'$, and the Distance of 10 wanting a Quarter, or 3 Quarters after, is the same Distance; an Example of which will explain this Matter fully. But I shall first shew how this Table is made. The Proportion is this:

As

Of DIALING.

267

As the Radius	10.000000
To the Sine of 53° the Latitude	9.902349
So is the Tangent of 60° or four Hours	10.238561
To the Tang. of the Dist. from Merid. $54^{\circ} 8'$	10.140910
as in the Table	

A TABLE shewing the LATITUDE of the principal Towns in Great-Britain and Ireland.

NAMES OF PLACES.		Lat.	NAMES OF PLACES.		Lat.
ENGLAND.					
	d.	m.		d.	m.
St. Alban's,	51	45	Lincoln,	53	16
Arundel,	50	44	Litchfield,	52	45
Berwick,	55	48	Northampton,	52	15
Bedford,	52	10	Newcastle,	54	58
Bristol,	51	28	Norwich,	52	45
Bury,	52	20	Nottingham,	52	59
Buckingham,	52	00	Oxford,	57	45
Cambridge,	52	15	Plymouth,	50	26
Canterbury,	51	19	Portsmouth,	50	48
Carlisle,	54	45	Reading,	51	23
Chester,	53	12	Salisbury,	51	6
Chichester,	50	50	Shrewsbury,	52	46
Colchester,	51	55	Stafford,	52	50
Coventry,	52	27	Stamford,	52	39
Dover,	51	6	Truro,	50	15
Derby,	52	57	Warwick,	52	20
Dorchester,	50	40	Winchester,	51	6
Durham,	54	55	Worcester,	52	15
Ely,	52	27	York,	52	58
Exeter,	50	54			
Falmouth,	50	15	WALES.		
Gloucester,	51	50	Brecknock,	52	18
Guildford,	51	12	Cardigan,	52	15
Harwich,	52	5	Carmarthen,	51	50
Hereford,	52	6	Caernarvon,	53	20
Hertford,	51	42	St. David's,	51	57
Huntington,	52	19	Denbigh,	53	15
Ipswich,	52	12	Flint,	53	17
London,	51	30	Landaff,	51	35
Lancaster,	54	5	Monmouth,	51	37
Leicester,	52	40	Pembroke,	51	46
			Radnor,	52	19

A a 2

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SCOTLAND.

<i>Aberdeen,</i>	57	12
<i>Dumblain,</i>	56	13
<i>Dumfries,</i>	55	4
<i>Dunkeld,</i>	56	36
<i>Edinburgh,</i>	55	57
<i>Fort William,</i>	56	55
<i>Glasgow,</i>	55	00
<i>Inverness,</i>	57	36
<i>Kincardine,</i>	57	5
<i>St. Andrew's,</i>	56	20
<i>Sterling,</i>	56	12
<i>Wick,</i>	58	40

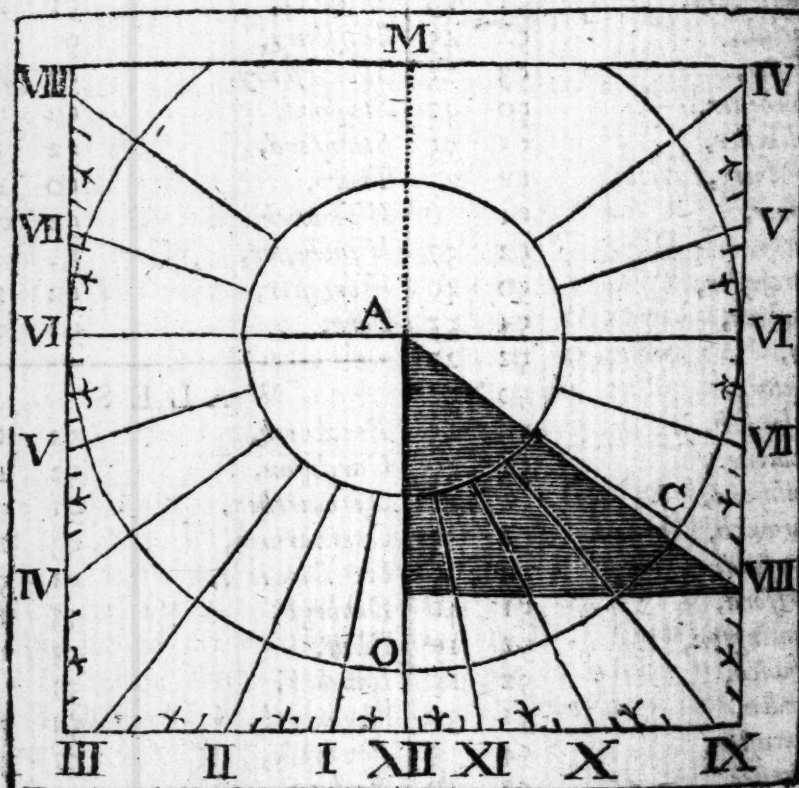
IRELAND.

<i>Armagh,</i>	54	30
<i>Athlone,</i>	53	20
<i>Balishannon,</i>	54	25

Carrick-Fergus,

<i>Carvan,</i>	54	45
<i>Clare,</i>	54	0
<i>Cork,</i>	52	40
<i>Drogheda,</i>	51	40
<i>Dublin,</i>	53	45
<i>Dundalk,</i>	53	16
<i>Galloway,</i>	54	5
<i>Inneskillin,</i>	53	12
<i>Kilkenny,</i>	54	20
<i>Kinsale,</i>	52	30
<i>Kildare,</i>	51	32
<i>Londonderry,</i>	53	10
<i>Limerick,</i>	54	52
<i>Waterford,</i>	53	35
<i>Wexford,</i>	52	12
<i>Youghal,</i>	52	15
	51	51

A HORIZONTAL Dial for the Latitude of fifty-two Degrees.



In making this Dial draw two Squares, one within another, leaving Space enough between them for the Figures of the Hours. Through the Middle of this draw a Line MO to represent the Meridian. Then cross it at right Angles, from six to six, and A shall be the Hour Line of six. Take 60 Degrees in your Compasses from the Line of Chords, and sweep Part of a Circle, as you see in the Example. On which, from the same Line of Chords, set off the Hours, Halves and Quarters, from the foregoing Table, and for the Latitude of 52° . Then draw a small Circle round A. This done, lay a Ruler to the Centre A, and through the Marks in the Circumference of the large Circle draw the Hour Lines, and make Marks for the Halves and Quarters. The Distance from six to seven is the same as from five to six; and the Distance from four to five on the other Side, is the same as from seven to eight; likewise the Distance from seven to eight is the same as from four to five; and the Distance from five to four on the other Side, is the same as from eight to seven. Then for the Latitude of the Place lay 52° down from O to C, and the Angle OAC will be the Height of the Style.

To make a HORIZONTAL DIAL for the Inhabitants of the EQUATOR.

The Ancients imagined the *Torrid Zone* was uninhabitable, on Account of excessive Heat; but Experience has shewn the Contrary, for there are several Countries in *Asia*, *Africa*, and *America*, which lie directly under the Equator, and yet are full of People; it will be therefore necessary to know how to make a Dial for the Inhabitants of those Parts.

In this Case a Horizontal Dial is certainly the best, and may be made with a great deal of Ease; for if you reckon the Height of your Gnomon ten Parts, then the Tangents in natural Numbers are the Distances of the Hours. But because every Book of Logarithms has not the Tangents separate from the Logarithms of the Tangents, I shall give you the Hour Distances extracted from thence, which will also serve exactly for East and West Dials.

A TABLE of the Hour-Distances for Polar, East and West Dials.

For East and West Dials.						For Polar Dials.	
Hours and Quarters.		Hours in Deg. and Min.		Hour Distances.		Hours and Quarters.	
VI		0	0	0	0	XII	
1	3	3	45	0	66	1	3
2	2	7	30	1	32	2	2
3	1	11	15	1	99	3	1
VII	V	15	0	2	68	I	XI
1	3	18	45	3	39	I	3
2	2	22	30	4	14	2	2
3	1	26	15	4	93	3	1
VIII	IV	30	0	5	77	II	X
1	3	33	45	6	68	I	3
2	2	37	30	7	67	2	2
3	1	41	15	8	77	3	1
IX	III	45	0	10	00	III	IX
1	3	48	45	11	41	I	3
2	2	52	30	13	32	2	2
3	1	56	15	14	96	3	1
X	II	60	0	17	33	IV	VIII
1	3	63	45	20	27	I	3
2	2	67	30	24	14	2	2
3	1	71	15	29	46	3	1
XI	I	75	0	37	32	V	VII
1	3	78	45	50	27	I	3
2	2	82	30	75	96	2	2
3	1	86	15	152	57	3	1

You may perceive by this Table that all the Hour Distances, from twelve to three and nine in Polar Dials, and from six to three and nine in East and West Dials, are less than the Length of the Gnomon, and from thence to the End they are much greater; for Instance, at five and seven and at eleven and one the Hour Distance is three times the Length of the Gnomon, and seven tenths, besides 32 Parts of a tenth; that is, 3 Lengths, 7 tenths, and a half. This may be readily measured with a Ruler that has a Diagonal Scale. This Horizontal Dial is called a Polar Dial, being

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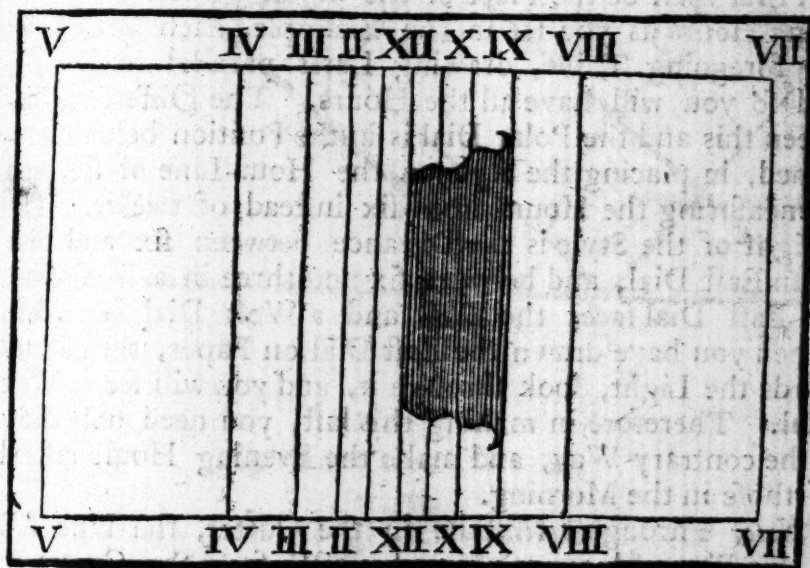


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being parallel to to the Axis of the World, and because the Plane of it is at right Angles to the Plane of the Equator.

Besides what has been already said, it will be proper to observe, that these Hour Distances are exactly the same as the Line of Tangents upon a two foot Ruler or Sector, reckoning 15° for one Hour, 30° for two, &c. as also 45° for the Height of the Gnomon. On some Rulers this Line is divided into Hours and Quarters, with the Word Pole at the Beginning. The Use of this Ruler will make the drawing of this Dial exceeding easy. After what has been said, I need only give you an Example in the following Figure.

A POLAR DIAL.



This is to be placed as a common Horizontal Dial, and the Gnomon, which you see is placed on the Hour-Line of twelve, is equal in Height to the Distance between the Hour-Lines of twelve and nine. It must stand perpendicular to the Plane, and the Shadow of it will shew the Hours distinctly from seven in the Morning till five in the Afternoon. It may be made longer by the Help of the Table, but it will make the Dial unreasonably long.

To make an EAST or WEST DIAL.

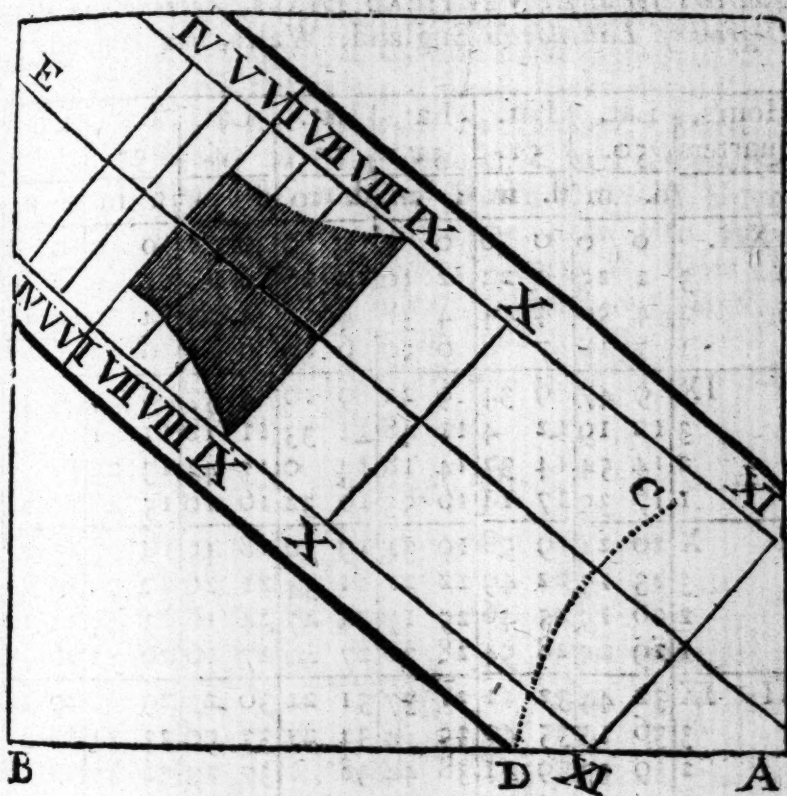
This is constructed by the same Principles as the former, only it is to be set upright, and the Line AE is to make an Angle with AB, parallel to the Horizon, equal to the Altitude of the Equator, which for *London*, as in this Example, is $38^{\circ} 30'$; therefore with 60° of a Line of Chords, and with one Foot of the Compasses in A, sweep part of a Circle CD. Then take $38^{\circ} 30'$ from your Line of Chords, and set the Arch off from D towards C; make a Mark, then draw the Line AE from the Centre A through the Mark, and this will represent the Equinoctial Line. Cross it at right Angles from six to six, as you see in the Scheme, and that shall be the Place of the Style. Then set off as many Hours as you see in the Example, each Way from the foregoing Table, drawing Lines parallel to VI VI, and so you will have all the Hours. The Difference between this and the Polar Dial is in the Position before-mentioned, in placing the Style on the Hour-Line of six, and in measuring the Hours from six instead of twelve. The Height of the Style is the Distance between six and nine in an East Dial, and between six and three in a West Dial. An East Dial faces the East, and a West Dial the West. When you have drawn the East Dial on Paper, turn it towards the Light, look through it, and you will see a West Dial. Therefore in making this last, you need only draw it the contrary Way, and make the Evening Hours instead of those in the Morning.

Note, Through a Mistake in the Cutter, the Line AE in this Figure does not proceed exactly from the Centre A, as it ought to have done.



The
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be used
Equato
calcula

An EAST DIAL.



Of VERTICAL DIALS.

These Dials are best made arithmetically, or by the Arches of the Hour Distances, which are found by the same Analogy as in Horizontal Dials; only instead of the Height of the Pole, the Complement to that Height must be used, or which is the same Thing, the Height of the Equator. However, I shall give the Hour-Distances ready calculated, in the same manner as the former.

A TABLE of the Distances of the Hours, Half Hours, and Quarters for direct VERTICAL DIALS, agreeable to all the Degrees of Latitude in England, Wales, and Ireland.

Hours, Quarters	Lat. 50.	Lat. 51.	Lat. 52.	Lat. 53.	Lat. 54.	Lat. 55.	Lat. 56.
	d. m.	d. m.	d. m.	d. m.	d. m.	d. m.	d. m.
XII.	0 0	0 0	0 0	0 0	0 0	0 0	0 0
1 3	2 25	2 22	2 19	2 16	2 12	2 9	2 6
2 2	4 50	4 44	4 38	4 32	4 26	4 20	4 14
3 1	7 18	7 8	6 59	6 50	6 40	6 32	6 21
I IX	9 47	9 34	9 22	9 10	8 57	8 44	8 31
1 3	12 19	12 4	11 48	11 33	11 18	11 1	10 45
2 2	14 54	14 37	14 18	14 0	13 43	13 23	13 3
3 1	17 35	17 14	16 53	16 32	16 10	15 48	15 24
II X	20 21	19 58	19 34	19 9	18 45	18 19	17 54
1 3	23 15	22 49	22 21	21 54	21 26	20 57	20 29
2 2	26 15	25 46	25 17	24 47	24 16	23 45	23 14
3 1	29 25	28 54	28 20	27 49	27 16	26 42	26 7
III IX	32 44	32 11	31 37	31 22	30 27	29 50	29 13
1 3	36 14	35 40	35 4	34 27	33 50	33 11	32 31
2 2	39 57	39 21	38 44	38 6	37 27	36 47	36 5
3 1	43 53	43 17	42 40	42 0	41 20	40 39	39 55
IV VIII	48 4	47 28	46 50	46 11	45 31	44 49	44 5
1 3	52 30	51 55	51 18	50 40	50 0	49 19	48 35
2 2	57 12	56 39	56 4	55 28	54 50	54 10	53 28
3 1	62 10	61 39	61 8	60 34	60 0	59 23	58 44
V VII	67 21	66 56	66 29	66 0	65 30	64 58	64 24
1 3	72 48	72 28	72 7	71 43	71 18	70 53	70 25
2 2	78 25	78 11	77 56	77 40	77 23	77 4	76 44
3 1	84 11	84 3	83 55	83 47	83 38	83 29	83 19
VI.	90 0	90 0	90 0	90 0	90 0	90 0	90 0

By the Help of this Table, you may make these Vertical Dials in the same Manner as the Horizontal Dials, the Manner of which need not be repeated. I shall therefore, for variety sake shew the Method of making them instrumentally. On the Edges of many Sectors, there are Lines inserted for this Purpose; one of them is marked Hours, and the other Lat. Take $38^{\circ} 30'$, the Complement of

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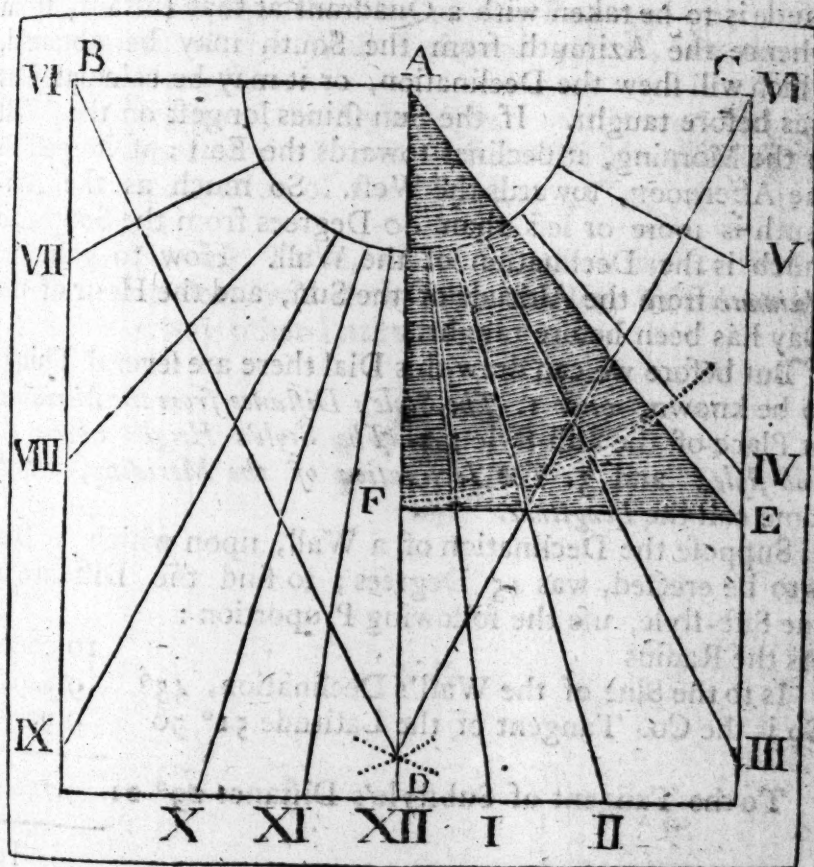
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of the Latitude, from the Line of Latitudes, and set it on BC both Ways, that is from A to B, and from A to C; then take the whole Length of the Line of Hours in your Compasses, and setting one End in B, make an obscure Arch at D; set it again in C, and make another obscure Arch at D to cross the former; draw Lines from B to D, and from C to D, the Point of Intersection. Then take the Hour Distances in your Compasses, and set them on the Lines BD and CD, making Marks for each Hour as you see in the Example: This done, draw two Squares round the whole, and from the Centre A, draw Lines through the Marks to the inward Square, and finish the whole according to the following Scheme. I observed before, that the Height of the Gnomon is $38^{\circ} 30'$, which is designed by the Angle FAE.

A VERTICAL DIAL.



A direct NORTH VERTICAL DIAL is nothing more than this Dial turned upside down, in which the Hours 9, 10, 11, 12, 1, 2, and 3 are useless, and consequently the drawing of them may be omitted when it is made for a North Plane.

Of DECLINING VERTICAL DIALS.

This is a Dial still remaining, which, if not the most useful, is generally most convenient, because it is to be placed on the Side of a Wall, which seldom or never faces the South directly, but declines sometimes towards the East, and sometimes towards the West. The chief Difficulty is to find how much it declines; this may be readily done if you observe when the Sun begins to glance on the Side of the Wall, at which Time the Hour and Minute is to be noted by a good Clock or Watch, and the Sun's Altitude is to be taken with a Quadrant at that Instant, from whence the Azimuth from the South may be obtain'd, which will shew the Declination, or it may be calculated as was before taught. If the Sun shines longest on the Wall in the Morning, it declines towards the East; if longest in the Afternoon, towards the West. So much as the Azimuth is more or less than 90 Degrees from the South, so much is the Declination of the Wall. How to gain the *Azimuth* from the Altitude of the Sun, and the Hour of the Day has been before taught.

But before we can draw this Dial there are several Things to be known, *viz.* 1. *The Style's Distance from the Meridian, or Place of the Sub-style*; 2. *The Style's Height above the Sub-style*; and 3. *The Inclination of the Meridian*, which some call the *Longitude*.

Suppose the Declination of a Wall, upon which a Dial is to be erected, was 45 Degrees; to find the Distance of the Sub-style, use the following Proportion:

As the Radius	10.00000
Is to the Sine of the Wall's Declination, 45°	9.84948
So is the Co. Tangent of the Latitude 51° 30'	9.90060

To the Tangent of Substyle's Distance 29° 21'	9.75008
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For

Of DIALING.

277

For the Height of the Style proceed thus:

As the Radius	10.00000
Is to the Co-Sine of the Wall's Declination, 45°	9.84948
So is the Co-Sine of the Latitude $51^{\circ} 30'$	9.79415
To the Sine of the Style's Height $26^{\circ} 7'$	9.64363

To find the Inclination of the Meridian, use the following Analogy.

As the Radius	10.00000
Is to the Co-Tangent of the Wall's Declination 45°	} 10.00000
So is the Sine of the Latitude $51^{\circ} 30'$	
To the Co-Tangent of the Inclination of the Meridian, $51^{\circ} 57'$	} 9.89354

Thus from the Elevation of the Pole $51^{\circ} 30'$, and the Declination of the Wall Eastward $45^{\circ} 0'$, we have the following Requisites.

The Height of the Style $26^{\circ} 7'$
 The Distance of the Sub-Style from the Meridian $29^{\circ} 21'$
 And the Inclination of the Meridian $51^{\circ} 57'$

The following Table, which is calculated for the Latitude of London, will shew how the like Tables may be framed for any other Latitude.

B b

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The Three Requisites in Dialing, calculated to every Degree of the Declination of the Plane, in the Latitude of 51 Degrees 30 Minutes.

Decln.	Sub Style's Distance Meridian.		Style's Height.		Inclinat. of Merid.		Decln.	Sub Style's Distance Meridian.		Style's Height.		Inclinat. of Merid.	
	d.	m.	d.	m.	d.	m.		d.	m.	d.	m.	d.	m.
1 00	4	38	29	1	17		46 29	46	25	37	52	58	
2 1	36	38	28	1	33		47 30	11	25	07	54	53	
3 2	23	38	26	3	49		48 30	35	24	38	55	50	
4 3	11	38	23	5	07		49 30	58	24	06	55	46	
5 3	58	38	20	6	23		50 31	21	23	35	56	42	
6 4	45	38	15	7	39		51 31	45	23	04	57	38	
7 5	32	38	10	8	55		52 32	05	22	32	58	33	
8 6	19	38	04	10	11		53 32	26	22	00	59	28	
9 7	05	37	57	11	27		54 32	46	21	28	60	23	
10 7	52	37	49	12	42		55 33	06	20	55	61	17	
11 8	38	37	40	13	57		56 33	24	20	22	62	10	
12 9	25	37	30	15	11		57 33	42	19	49	63	04	
13 10	08	37	21	16	26		58 34	00	19	16	63	57	
14 10	54	37	10	17	40		59 34	17	18	42	64	49	
15 11	38	36	58	18	54		60 34	33	18	08	65	41	
16 12	22	36	43	20	07		61 34	50	17	34	66	33	
17 13	05	36	32	21	20		62 35	05	17	00	67	24	
18 13	49	36	18	22	33		63 35	18	16	25	68	16	
19 14	31	36	03	23	45		64 35	34	15	50	69	07	
20 15	13	35	48	24	57		65 35	47	15	15	69	57	
21 15	54	35	31	26	08		66 36	00	14	40	70	47	
22 16	36	35	16	27	18		67 36	13	14	05	71	38	
23 17	16	34	57	28	29		68 36	25	13	29	72	27	
24 17	56	34	39	29	38		69 36	36	12	53	73	16	
25 18	35	34	21	30	47		70 36	46	12	18	74	06	
26 19	13	34	01	31	56		71 36	55	11	41	74	55	
27 19	50	33	42	33	04		72 37	06	11	06	75	44	
28 20	29	33	21	34	12		73 37	15	10	29	76	33	
29 21	05	32	59	35	19		74 37	24	09	53	77	21	
30 21	40	32	37	36	25		75 37	32	09	16	78	09	
31 22	15	32	15	37	31		76 37	40	08	40	78	57	
32 22	50	31	52	38	36		77 37	47	08	03	79	46	
33 23	25	31	27	39	41		78 37	53	07	27	80	33	
34 23	59	31	04	40	46		79 37	59	06	49	81	21	
35 24	31	30	40	41	49		80 38	04	06	12	82	09	
36 25	04	30	14	42	52		81 38	09	05	35	82	56	
37 25	35	29	48	43	55		82 38	14	04	55	83	43	
38 26	04	29	22	44	58		83 38	17	04	20	84	31	
39 26	35	28	56	45	59		84 38	21	03	44	85	18	
40 27	03	28	29	47	00		85 38	23	03	06	86	05	
41 27	33	28	01	48	00		86 38	26	02	28	86	58	
42 28	01	27	33	49	00		87 38	28	01	52	87	39	
43 28	29	27	05	50	00		88 38	29	01	15	88	26	
44 28	55	26	36	50	59		89 38	29	00	37	89	13	
45 29	21	26	07	51	57		90 38	30	00	00	90	00	

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279

We must observe that the Inclination of the Meridian being $51^{\circ} 57'$, which is more than 45° , or three Hours, the Distance of Nine o'Clock from the Meridian, you must substract 45° from $51^{\circ} 57'$, and there will be $6^{\circ} 57'$, the Distance of Nine o'Clock from the Sub-Style. Likewise because Eight o'Clock is 60° distant from the Meridian, substract $51^{\circ} 57'$ from it, and there will remain $8^{\circ} 3'$, the Distance of Eight o'Clock from the Sub-Style. All the rest of Hours, and Parts of Hours, are easily found by adding fifteen Degrees for an Hour; $7^{\circ} 30'$ for half an Hour, and $3^{\circ} 45'$ for a Quarter, as will plainly appear by the following Table. The next Thing to be done is to find the Hour Distances, which is performed by the following Proportion.

As the Radius	10.00000
To the Tangent of $6^{\circ} 57'$, the Equinoctial Distance	9.08599
So is the Sine of $26^{\circ} 7'$, the Poles Height above the Plane	9.64363
To the Tangent of $3^{\circ} 4'$, the Hour Distance for 9 o'Clock	8.72962

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A TABLE

A TABLE of the Equinoctial Distances of the Hours from the Sub-Style, and also of the true Hour-Distances.

Hours and Halves.	Equinoctial Distances.		True Hour Distances.	
	D.	M.	D.	M.
III	83	3	74	31
3 $\frac{1}{2}$	75	33	57	38
IV	68	3	47	39
4 $\frac{1}{2}$	60	33	37	55
V	53	3	30	19
5 $\frac{1}{2}$	45	33	24	9
VI	38	3	19	0
6 $\frac{1}{2}$	30	33	14	33
VII	23	3	10	36
7 $\frac{1}{2}$	15	33	6	59
VIII	8	3	3	34
8 $\frac{1}{2}$	0	33	0	15
IX	6	57	3	4
9 $\frac{1}{2}$	14	27	6	28
X	21	57	10	3
10 $\frac{1}{2}$	29	27	13	57
XI	36	57	18	18
11 $\frac{1}{2}$	44	27	23	20
XII	51	57	29	20
12 $\frac{1}{2}$	59	27	36	42
I	66	57	45	57
1 $\frac{1}{4}$	74	27	57	41
II	81	57	72	11
2 $\frac{1}{2}$	89	27	88	46

In drawing this Dial, after you have let fall the Perpendicular Line from A to B, which represents the Meridian, cross it at right Angles with the Line DE; then from the Centre A, describe the Semicircle FD, and set off $29^{\circ} 21'$ from F to H; at H make a Mark, and from the Centre A, through the Mark H, draw the Line AC for the Line of the Sub-Style; from H, the Mark of the Sub-Style, towards K, set off $26^{\circ} 7'$, the Height of the Style, and draw

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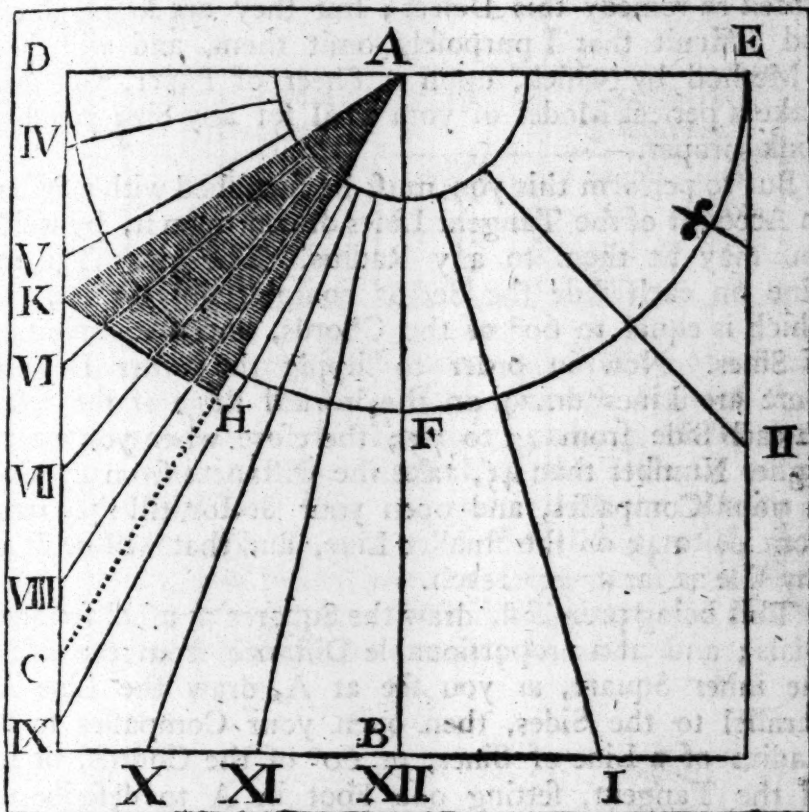
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draw the Line AK. This done, mark off all the Hours and half Hours on the Semi-Circumference from the Sub-Style, and draw Lines for the Hours, as you see in the Example.

A VERTICAL DIAL declining Eastward from the South.



When the Dial is thus drawn, you have four Dials made by this single Example for the same Declination 45° ; because if you turn it upside down, it will become a *North-East declining Dial*; oil the Draught, and the back Side will shew a *Westward declining Dial*, only changing the Hours of the Morning to those of the Evening. Then turn it upside down, and you have a *North-West Decliner*.

Of VERTICAL DIALS without a Center.

Dials that decline 80° or upwards, East or West, have so small an Elevation of the Style, that the Hour Lines run too close together, which make them of little Use without some other Help. Various Ways have been invented to remedy this Defect; but they are so perplexed and difficult that I purposely omit them, and will shew a Method by which, upon a Sheet of Paper, you may make a perfect Model of your Dial for any Size you shall think proper.

But to perform this you must be furnished with a Sector, on Account of the Tangent Lines drawn upon it, by which you may fit them to any Radius. The great Tangent Line on each Side the Sector contains only 45° Degrees, which is equal to 60° of the Chords, and the whole Line of Sines. Now in order to supply the other Degrees, there are Lines drawn on the inward Edge of the Sector on each Side from 45 to 75 ; therefore when you want a higher Number than 45 , take the Distances from 45 to 45 in your Compasses, and open your Sector till they reach from 45 to 45 on the smaller Line, and that will be fit for any Use as far as 75° reach.

This being premised, draw the Squares as usual for other Dials; and at a proportionable Distance from the Side of the inner Square, as you see at A, draw the Line AB parallel to the Sides, then open your Compasses to the Radius of a Line of Sines, or 60° of the Chords, or 45° of the Tangent, setting one Foot in A to describe the obscure Arch BE. Suppose then the Declination of the Plane to be $83^\circ 37$ Minutes in the Latitude of London, you may find out by Calculation, as in the preceeding Section, or by the Table, that the Height of the Style is $3^\circ 53'$, the Distance of the Sub-style from the Meridian $38^\circ 18'$, and the Inclination of the Meridian 15° ; therefore take $38^\circ 18'$ in your Compasses from your Line of Chords, and set it from B to C; likewise $3^\circ 58'$, and set it from C to D; make Marks at each, and from the Centre A draw the obscure Lines AC and AD: This done, allow a proper Height for your Style, as from C to E, and draw the Line EF parallel to DA. This done, take the Height of the Style in your Compasses on the Line HK, drawn at

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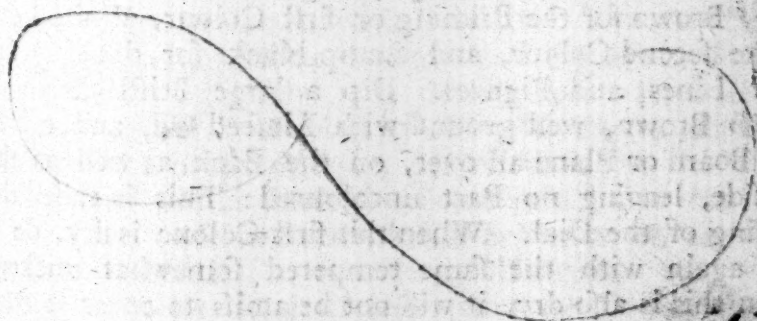
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at right Angles to the Substyle, and open the Sector to the Distance from 45 to 45 on the great Line of the Tangents.

But before you proceed any farther, it will be proper to make a Table of the Hour Distances in the following Manner: As the Inclination of the Meridian is 85° , which is 5 Degrees less than 90° or six Hours, therefore six o'Clock is five Degrees beyond the Substyle, as from the following Table will appear.

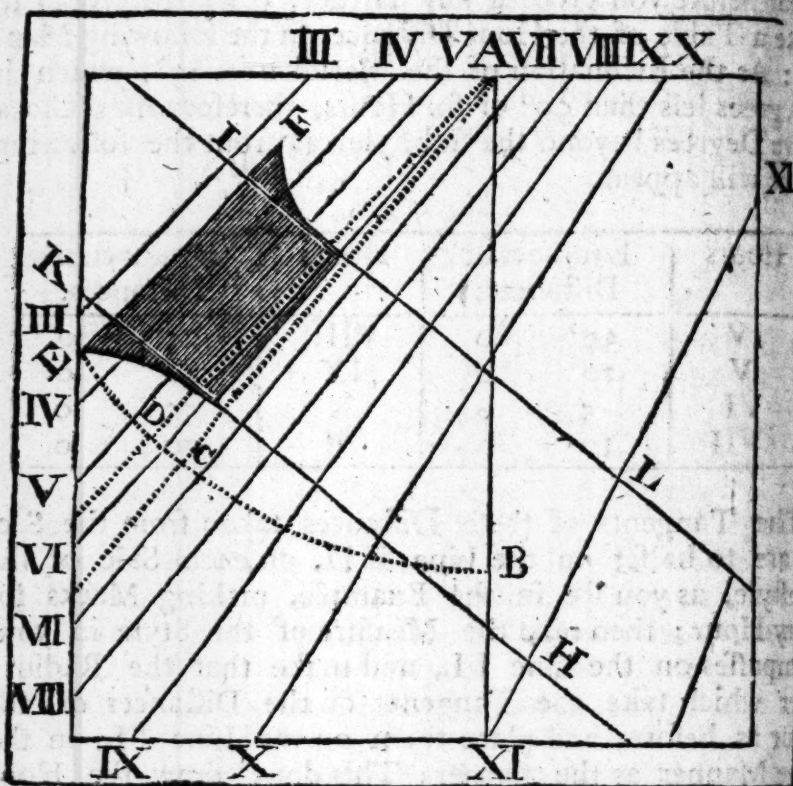
Hours	Equinoctial Distances.	Hours	Equinoctial Distances.
IV	$35^{\circ} 0$	VIII	$25^{\circ} 0$
V	$20^{\circ} 0$	IX	$40^{\circ} 0$
VI	$5^{\circ} 0$	X	$55^{\circ} 0$
VII	$10^{\circ} 0$	XI	$70^{\circ} 0$

The Tangents of these Distances taken from the Sector are to be set on the Line KH, on each Side of the Substyle, as you see in the Example, making Marks for every Hour; then take the Measure of the Style in your Compasses on the Line IL, and make that the Radius; after which take the Tangents of the Distances of the Hour as before, and place them on the Line IL, in the same Manner as the former: This done, draw the Hour Lines through the Marks, and the Dial is finished.



VER.

A VERTICAL DIAL declining EAST above 80 Degrees.



Of the Colouring SUN DIALS.

THE best Colours for painting Sun-Dials are, *Spanish* Brown for the Priming or first Colour, White Lead for the second Colour, and Lamp-black for drawing the Hour Lines and Figures. Dip a large Bristle-Brush in *Spanish* Brown, well ground with Linseed Oil, and colour your Board or Plane all over, on the Back as well as the Foreside, leaving no Part uncoloured: This is called the Priming of the Dial. When this first Colour is dry, do it over again with the same tempered somewhat thicker: When this is also dry, it will not be amiss to cover it over again with the same Colour, because by this Means the Work will be more substantial, and last the longer.

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When this last Time of colouring is dry, then use White Lead, with which colour the face of the Plane all over. When it is dry it may be repeated three or four times, and the Face will be fit to withstand the Violence of the Weather. This done, draw a Horizontal Line on your Plane with a Black Lead Pencil, near the uppermost Edge of the Dial; then draw the Lines on the Margin for a Boundary, and others parallel thereto to contain the Hours, Half-Hours, and Quarters: Then take the Paper Draught, fairly drawn, and apply the horizontal Line of your Draught to the horizontal Line of the Plane, taking care to place the Centre in the Middle of the Line if your Dial be full South; but if it declines much, use your own Discretion, remembering that your Draught will serve as a Guide.

When the Paper Draught is properly fitted to your Plane, and fastened with Pins or small Tacks, then let the Lines thereon be transferred to the Plane, by laying a Ruler over every Hour, half-hour, and Quarter Division; and where the Ruler intersects the boundary Lines, there make Marks, by drawing Lines with a Black Lead Pencil, of such a Length as each Division requires. The viewing of a Dial well painted, drawn, and made, will be a considerable Help in this Respect: However, you must not forget the Line of the Substyle, if it be a declining Dial, that the Style or Gnomon may be properly placed.

When the Draught is thus transferred to the Plane, colour the boundary Lines with good Lamp-Black, or Ivory Black Paint; as also the Hour, Half-Hour, and Quarter Divisions must be drawn with the same. Let the Colour be as thick and as stiff as you can possibly use it, so as to draw a clear and smooth Line; then draw the Figures with the same Colours; and last of all take care to place the Gnomon of a proper Height, perpendicular to the Plane, and the Dial will be finished. Some indeed put the Date of the Year, and some remarkable Sentence on the Top, but that must be left to your own Discretion.

Some, who are fond of Show, are for having the Figures gilt, and then you may take Gold Size to draw them with, which may be made with drying Oil, and yellow Oker, ground as fine as the Oil itself, to lay your Gold on

on. You will know when it is sufficiently dry to gild upon, by touching it with the End of your Finger; for if your Finger sticks a little thereto, without bringing the Colour off it is dry enough; but if the Colour comes off, you must let it alone a little longer, otherwise it will drown your Gold. If it be too dry, there is no other Remedy but new sizing.

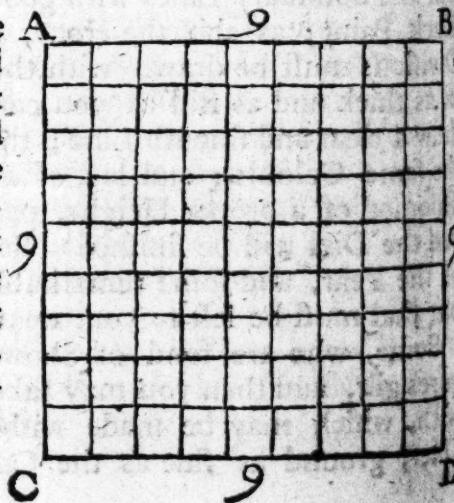
When your Size is ready for gilding, take a Book of Leaf-Gold, and take out a Leaf with Cane Plyers, and lay it on the gilding Cushion, and if it does not lie smooth blow it with your Breath, which will lay it flat and even; then with a Knife of Cane, or for want of it, an ordinary Pocket Knife that has a very smooth Edge and wiped very dry, cut the Gold into such Pieces as are fit for your Work; then with your gilding Pallet, which is a little Bit of Wood, proper-shaped, and a woollen Cloth glued to it, take up your Gold, which may be readily done if you breathe upon the Cloth, touch the Gold, and lay it on your Size; then press it down with a Bunch of Cotton, or a Hare's Foot. When all Parts are quite dry, brush off the loose Gold with a Hare's Foot, and so the Gilding will remain fair and beautiful.



Of MEASURING.

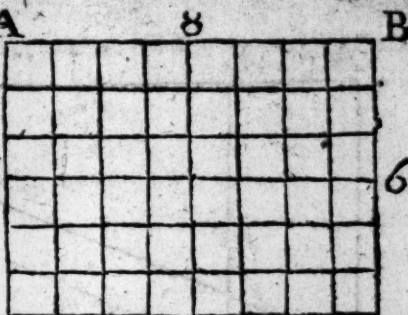
Of MEASURING SUPERFICIES.

A Square is a Figure **A** with four equal Sides, and as many right Angles. It is measured by multiplying the Side into itself, and the Product is the Content. Let **A**, **B**, **C**, **D**, be a true Square, each Side being nine Feet, Yards, Poles, or other Measure; multiply nine by itself, and the Product is 81.



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A PARALLELOGRAM, **A** 8 **B**
 or long Square, has four
 Sides, and as many right
 Angles, the opposite Sides
 of which are equal and pa-
 rallel: Multiply the Length
 by the Breadth, and the
 Product will give the Con-
 tent. Thus in the adjacent
 Figure **A**, **B**, **C**, **D**, multiply **C** 8 **D**
 8, the Length, by 6, the Breath, and the Product is 48,
 the Content.



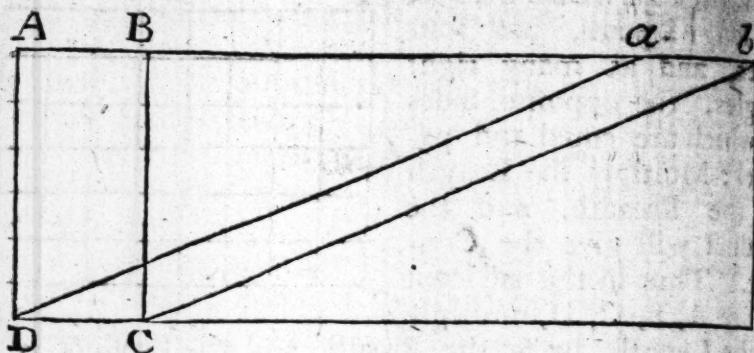
Here it may be observed, that if two Superficies have the same Circumference, unless the Figures are the same, the Content will be by no Means equal. Thus in the Square just mentioned, the Sum of all the Sides is 36. Likewise a Parallelogram, that has two Sides equal to six each, and the other two equal to twelve each, will have 36 for the Circumference and 72 for the Content, as appears by multiplying one Number into the other. Whereas the Content of the Square is 81; which makes a considerable Difference. Many a Person has been cheated for want of understanding this Rule.

A RHOMBUS **A** B
 is a Figure having
 four equal Sides
 with unequal An-
 gles, two of which
 that are opposite
 being obtuse and
 the other two op-
 posite Angles a-
 cute, as in the Fi-
 gure annexed. To
 measure it, let fall a Perpendicular from **B** to **E**. Suppose
 the Measure of this to be 13, and the Sides **A** **B**, **A** **C**,
B **D** and **C** **D** 16 each; multiply the Perpendicular 13
 with one of the Sides, and the Product 208, will be the
 Content.



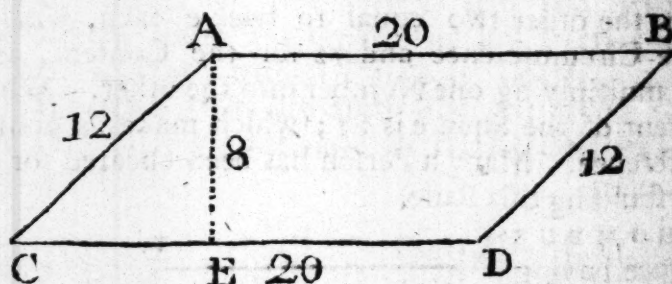
This will be very evident when we shall understand that every Rhombus and Rhomboides is equal to a Square or a Parallelogram that stands on the same Base between the same Parallels.

Thus



Thus the Parallelogram A, B, C, D, has the same Dimensions as $a b C D$, and therefore the Perpendicular A D, multiplied into the Base, must needs give the Content of both. The same will hold good in Triangles of all kinds.

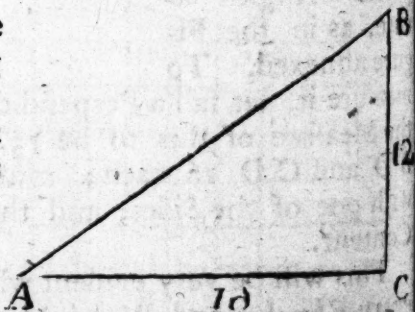
A RHOMBODES is a Figure having four Sides, two of



which are longer than the other two, but the opposite Sides are equal. It has likewise two acute Angles, and two obtuse: Those opposite to each other are equal. Let fall a Perpendicular from A to E, the Measure of which is 8; multiply 8 by 20, the longest Side, and the Content will be 160.

A right-angled Triangle is measured by multiplying half the Perpendicular by the Base, and the Product will be the Content. Thus half the Perpendicular B C is 6 multiplied into the Base A C 16; the Product is 96, the Content. Or if you multiply half the Base into the whole Perpendicular, the

Product will be the same.



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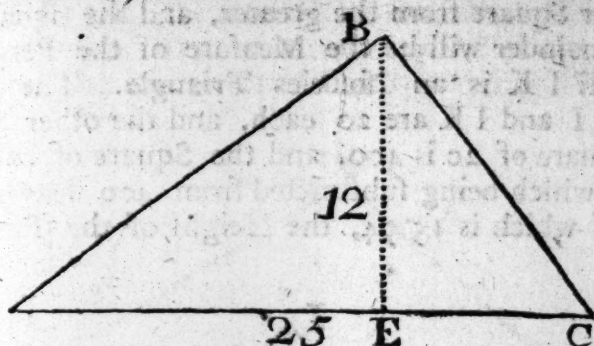
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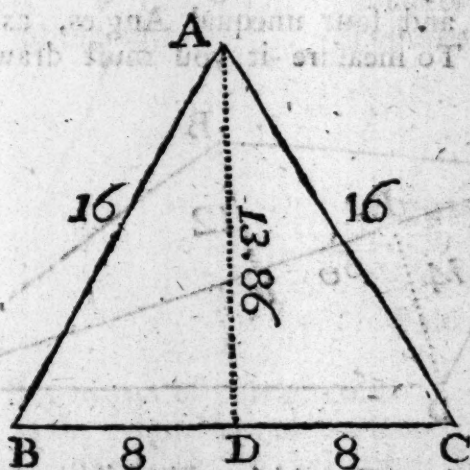
Of MEASURING. 289

If the Triangle is oblique-angled, let fall a Perpendicular from B, the obtuse Angle, and then multiply half



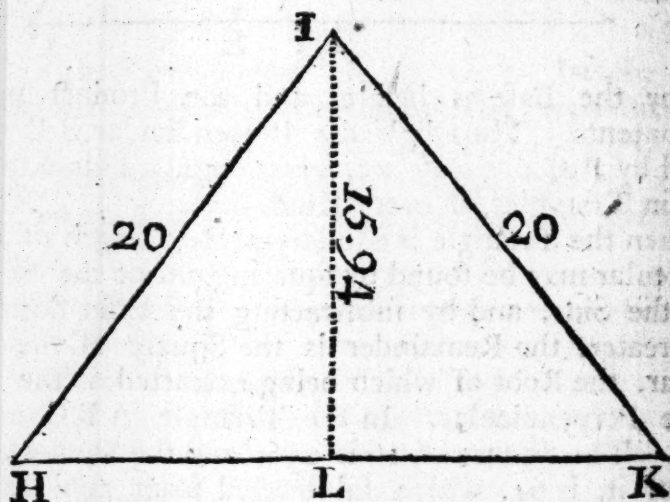
of it by the Base as before, and the Product will give the Contents. Thus half the Perpendicular B E 6, multiplied by A C the Base 25, gives 150. This Rule holds good in Triangles of every Kind.

When the Triangle is equilateral the Length of the Perpendicular may be found by squaring one of the Sides, and half the Side, and by subtracting the lesser Square from the greater, the Remainder is the Square of the Perpendicular, the Root of which being extracted is the Measure of the Perpendicular. In the Triangle A B C each Side is 16. The Square of 16 is 256, and the Square of 8 the half of it, is 64, which subtracted from 256 leaves 192 the Square Root of which 13.86 equal to the Perpendicular A D.

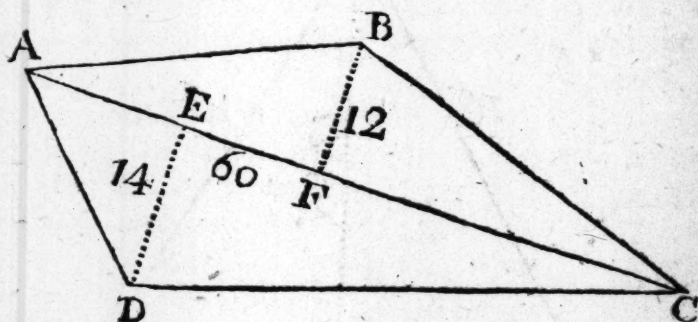


The Perpendicular of an Isosceles Triangle may be measured in the same Manner only by squaring one of the equal

equal Sides and half the other, and then by subtracting the lesser Square from the greater, and the square Root of the Remainder will be the Measure of the Perpendicular. Thus $H I K$ is an Isosceles Triangle. The two equal Sides $H I$ and $I K$ are 20 each, and the other Side is 24. The Square of 20 is 400, and the Square of half $K H$ is 144, which being subtracted from 400 leaves 256, the Root of which is 15.94, the Height of the Perpendicular



A TRAPEZIUM in an irregular Figure, having four unequal Sides and four unequal Angles, as in the Figure $A B C D$. To measure it you must draw the diagonal



Line from A to C , which will reduce it into two Triangles $A B C$ and $A D C$. Let fall the Perpendiculars $B F$ and $E D$; then measure the Length of these, as for Instance, $A C$ is 60, $B F$ 12, and $E D$ 14; add the two Per-

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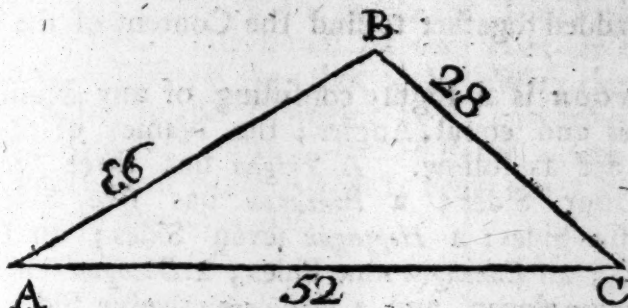
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Of MEASURING. 291

Perpendiculars together, and they make 26, the half of which is 13; multiply the Diagonal 60 by 13, and the Product will be 780, the Content of the Trapezium.

There is another Way of measuring a Triangle, which is sometimes more convenient than by letting fall a Per-



pendicular. The Rule is to add all the Sides together and then to take half the Sum; afterward substract each Side severally from half the Sum, and note the Differences. This done, multiply the half Sum by all those Differences, one after another, and the last Product will be a Sum out of which you are to extract the Square Root, which will be the Content of the Triangle.

The Sides

AC	52	6	Differences
AB	36	22	
BC	28	30	

Sum 116 of all the Sides

Half 58

Half Sum	58
Difference	30

Product	1740
Difference	22

	3480
	3480

Difference	38280
	6

Product	229680
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The Logarithm of this Number 5.361123

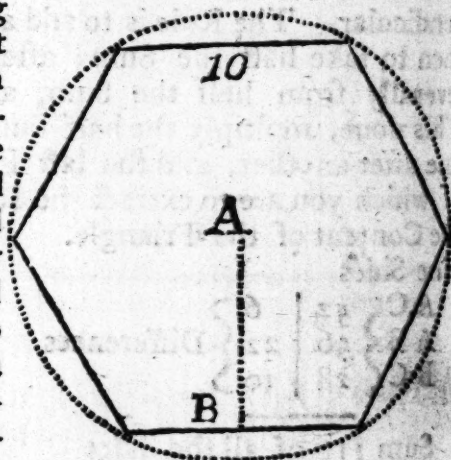
Half is the Logarithm of the Root 2.680561

The Number answering to half the Logarithm is 479725. Now as the Index is 2, the whole Number can be but three Figures, that is 479; the rest are Decimal Fractions. The best Tables of Logarithms for this Purpose

pose are *Sherwin's* and *Gardiner's*. If these are wanting the Root may be extracted the common Way, as has been before taught.

All irregular Figures, if possible, are to be reduced to Triangles, and when the Content of each is known, they are to be added together to find the Content of the whole Figure.

A POLYGON is a Figure consisting of any Number of equal Sides and equal Angles; the Names of the most common are as follow. A *Trigon* has three Sides; a *Tetragon* four Sides; a *Pentagon* has five Sides; a *Hexagon* six Sides; a *Heptagon* seven Sides; an *Octagon* eight Sides; an *Enneagon* nine Sides; a *Decagon* ten Sides; an *Hendecagon* eleven, and a *Dodecagon* twelve Sides. The easiest Way of drawing a Polygon is to inscribe it within a Circle; to perform which divide 360, the Degrees in the Circle, by the Number of Sides, and then taking the Chord of these Degrees in your Compasses that is the Chord of 120 for a *Trigon*; 90 for a *Tetragon*, 72 for a *Pentagon*; 60 for a *Hexagon*; $51^{\circ} 26'$ for a *Heptagon*; 45 for an *Octagon*; 40 for an *Enneagon*; 36 for a *Decagon*; $33^{\circ} 44'$ for a *Hendecagon*, and 30 for a *Dodecagon*. Then make Marks in the Circumference, as you see in the Example, and draw Lines from one to the other. This is easily done, it being a *Hexagon*, for the Radius is equal to the Chord of 60 Degrees, which is one Side of this Figure. To measure any of these Figures, you must let fall a Perpendicular from the Center to the Middle of any of the Sides, and multiply the Sum of all the Sides by one half of the Perpendicular, and the Product will be the Content. Thus if one Side is 10, the Perpendicular, A B will be 8,66, half of which is 4,33; multiply 60, the Sum of the Sides, with this, and the Product will be 259,8, the Content; or which is the same Thing, multiply half the Sum 30 by the whole Perpendicular and the Content will be the same.

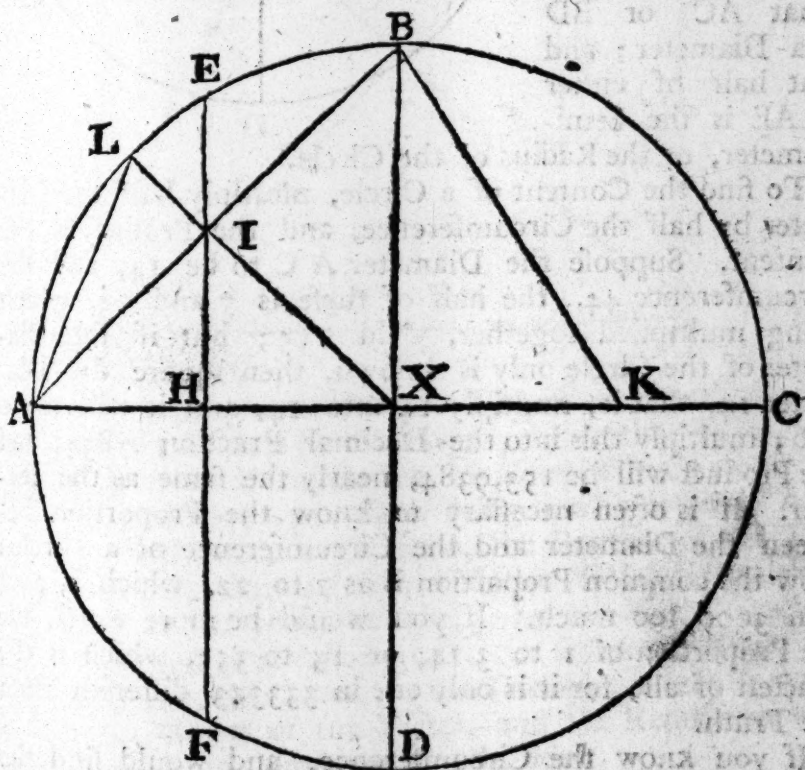


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Of MEASURING. 293

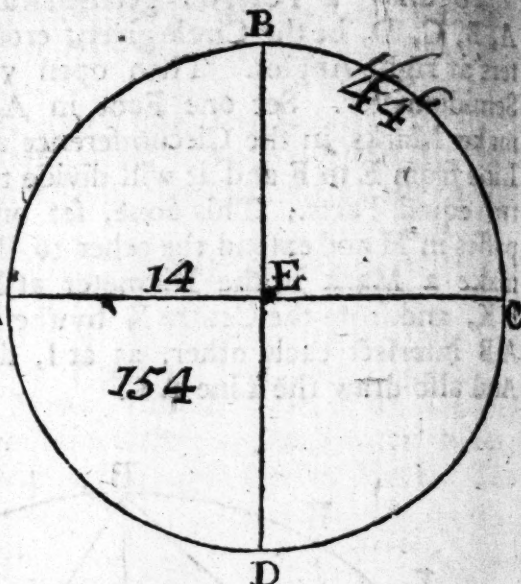
To draw a Polygon geometrically in a Circle. Let A, B, C, D, be the Circle given, cross it with two Diameters at right-Angles. Then open your Compasses to the Semidiameter. Set one Foot in A, and with the other make Marks in the Circumference at E and F. Draw a Line from E to F and it will divide the Semidiameter into two equal Parts. This done, set one Foot of the Compasses in H and extend the other to B. With this opening make a Mark in the Diameter at K, and draw the Line B K, and from the Centre X by the Point where E F and A B intersect each other, as at I, draw the Line X I L. And also draw the Line A L.



Now observe E F is the Side of a Trigon or Triangle to be inscribed in a Circle. A B is the Side of a Tetragon or Square. B K is the Side of a Pentagon. X A is the Side of a Hexagon. A L is the Side of an Octagon, and X K is the Side of a Decagon. It is usually said that E H is the Side of a Heptagon, but it wants six Minutes of Truth.

294 Of MEASURING.

A CIRCLE is so well known, it needs no Definition but it may be proper to observe that E is the Centre. A B C D the Periphery or Circumference; A B C, or A D C, a Semicircle; ABE or A D E, or D C E or BCE is a Quadrant: That AC or BD is a Diameter; and that half of either as AE is the Semidiameter, or the Radius of the Circle.



To find the Content of a Circle, multiply half the Diameter by half the Circumference, and the Product is the Content. Suppose the Diameter A C to be 14, and the Circumference 44, the half of these is 7 and 22, which being multiplied together, yield 154; but if the Diameter of the Circle only is known, then square the Diameter 14, that is, multiply 14 into 14, and it will make 196; multiply this into the Decimal Fraction .7854, and the Product will be 153.9384, nearly the same as the former. It is often necessary to know the Proportion between the Diameter and the Circumference of a Circle: Now the common Proportion is as 7 to 22, which is only 1 in 3000 too much. If you would be more exact, use the Proportion of 1 to 3.14, or 13 to 355, which is the exactest of all; for it is only one in 333333 different from the Truth.

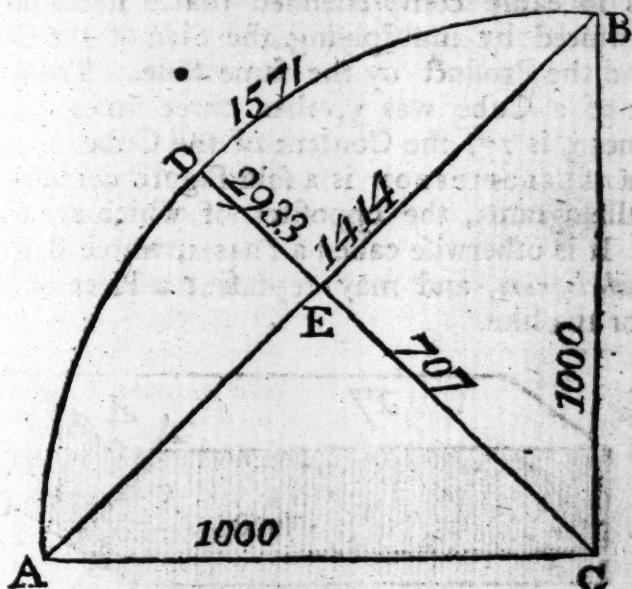
If you know the Circumference, and would find the Diameter, the Proportion is as 22 to 7, or as 3.14 to 1, or 355 to 113. Any SECTOR of a Circle, whether a Semicircle or a Quadrant, or more or less, which has one Point or Angle at the Center of the Circle may be measured by the former Rule; that is, let half the Arch be multiplied by the Semidiameter, and you will have the Content.

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Of MEASURING. 295

But the greatest Difficulty lies in measuring the Segment of a Circle, that is, that Part of a Circle which is contained between a Chord and an Arch of the same Circle. Thus AEB is the Chord, ADB the Arch, and AEB, BDA the whole Segment. The most certain Way to measure a Segment is to enlarge it into a Sector,



as in the Example before us: For if you measure the Triangle ABC as is before taught, by letting fall a Perpendicular from C to E, the Measure of which will be 707, the half is 353,5; which being multiplied into AB, the Base will produce 500000, the Content of the Triangle. For the Content of the Sector or Quadrant multiply half 1571, which is 785,5, by 1000, the Radius, and the Product will be 785500, the Content; then subtract 500000, the Content of the Triangle, from 785500, the whole Content of the Sector, and the Remainder will be 285500, the Content of the Segment.

The common Way is to multiply two thirds of 293, which is 195 4, by 1414, and the Product will be 2762956. This you may find is less than 2855000, almost a 27th Part, and consequently is not so exact as the other Way.

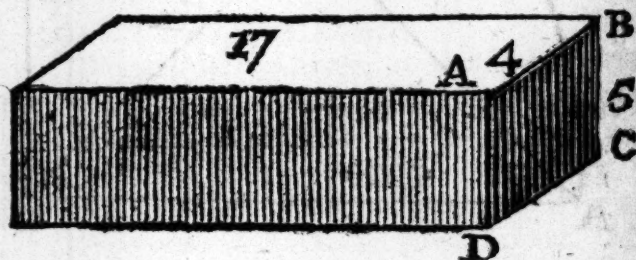
Note, Authors have given various Methods of reducing all Sorts of Plane Figures to a Square geometrically. But all that Labour may be spared by first gaining the superficial Content, and then extracting the Square Root; for that

that Root will be the Side of a Square equal to the Content of the Figure, be it what it will.

OF MEASURING SOLIDS.

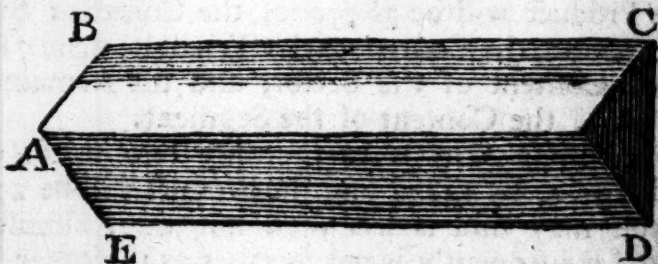
A **CUBE** is a square Solid, comprehended under six geometrical Squares, being exactly in the Shape of a Dye; which is so easily comprehended that it needs no Figure. It is measured by multiplying the Side of the Cube into itself, and the Product by the same Side. Thus, suppose the Side of a Cube was 3, then three times 3 is 9, and three times 9 is 27, the Content of the Cube.

A **PARALLELOPIPEDON** is a sold Figure contained under six Parallelograms, the opposites of which are equal and parallel. It is otherwise called a **PRISM**, whose Base, ABCD is a *Parallelogram*, and may represent a Piece of Timber, Stone, or the like.



To measure it get the superficial Content of the End, multiply that into the Length, and the Product will give the Content. Thus 4 multiplied into 5 gives 20, the superficial Content of the End; which multiplied into 17, the Length gives 340, the Content of the whole.

A **TRIANGULAR PRISM**, as ABCD, is measured like

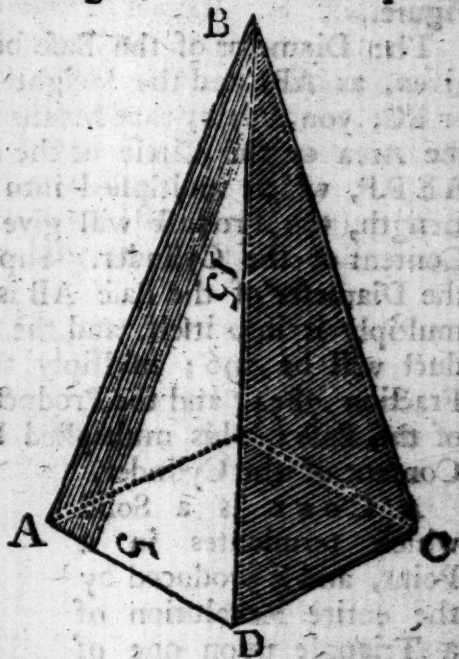


the former, only you must obtain the superficial Content of the End, as in other Triangles, by letting fall a Perpendicular, and then multiply the Content by the Length, and

and you will have the Content of the whole. This is otherwise called a Prism, whose Base is a Triangle. It is a general Rule for Prisms of all Kinds to get the superficial Content of the Base, and then to multiply it into the Length, and you will have the Content. Thus a Prism may have its Base a *Pentagon, Hexagon, Heptagon, &c.*

A PYRAMID is a solid Figure, whose Base is a *Polygon*, and whose Sides are plain Triangles, the several Tops of which meet in one Point. The Base of a Pyramid must be measured like the Base of a Prism, for it may consist of three, four, five, six, seven, &c. Sides; and when that is obtained multiply it into one third of the Height, and that will give you the Content of the Pyramid.

The Base of the annexed Pyramid, *ABCD*, is a Square, the Side of which is 5, and the Height is 15, one third of which is 5. Then for the Base say, five times 5 is 25, which multiplied by 5, one third of the Height, makes 125, the Content of the Pyramid.



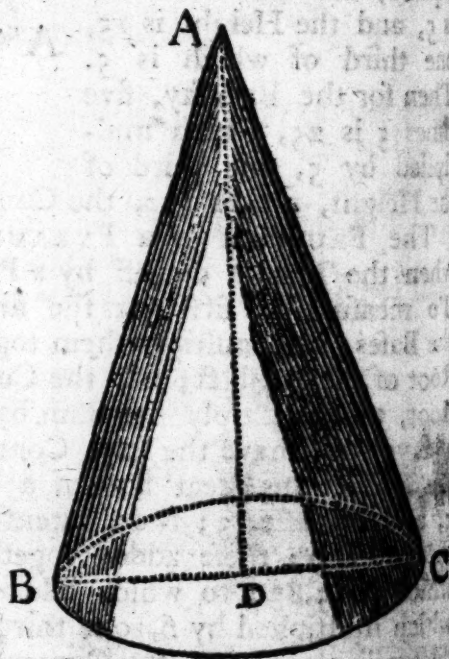
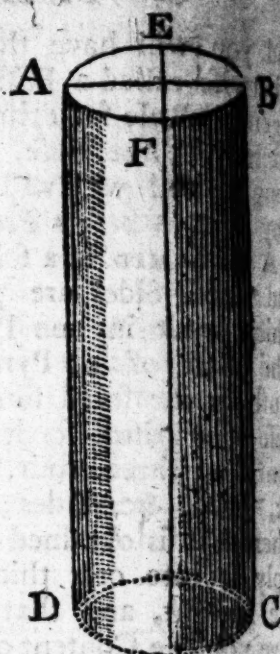
The FRUSTUM of a PYRAMID is the remaining Part when the Top is cut off by a Plane parallel to the Base. To measure it, first get the superficial Content of both the Bases, and multiply them together; extract the Square Root of the Product; add the Content of both Bases to the Root, then multiply the Sum by one third of the Height, and you will have the solid Content of the Frustum. Let the Side of the great Base of a Quadrangular Frustum be 5, and the lesser 3; the Content of the first is 25, and of the second 9; these added together make 34, the Root of which is 5,83; to which add 34, and the Sum is 39,83, which multiplied by 6, one third of the Height, the Product will be 238,98, the Content of the Frustum.

298 Of MEASURING.

A CYLINDER is a Solid which is produced by the entire Revolution of a Parallelogram about one of its Sides. It is terminated by two Bases, which are equal Circles, described by the two opposite Sides of the Parallelogram. The Stone Roller of a Garden exactly resembles this Figure.

The Diameter of the Base being given, as AB, and the Height AD or BC, you may by that Means find the Area of the Circle at the Base AEBF, which multiplied into the Length, the Product will give the Content of the Cylinder. Suppose the Diameter of the Base AB is 14, multiply it into itself, and the Product will be 196; multiply this again by the Decimal Fraction .7854, and the Product will be 153.938, the Area of the Base: This multiplied by 16 gives 2463.008, the Content of the Cylinder.

A CONE is a Solid which terminates in a Point, and is produced by the entire Revolution of a Triangle upon one of its Sides. When the generating Triangle ABD has one of its Angles right at D, it is called a right Cone, because then the Axis will be perpendicular to the Base; but if the Triangle ABD had been oblique, it would have been called an inclined Cone, because the Axis would have been inclined to the Base. I am now speaking of the former.



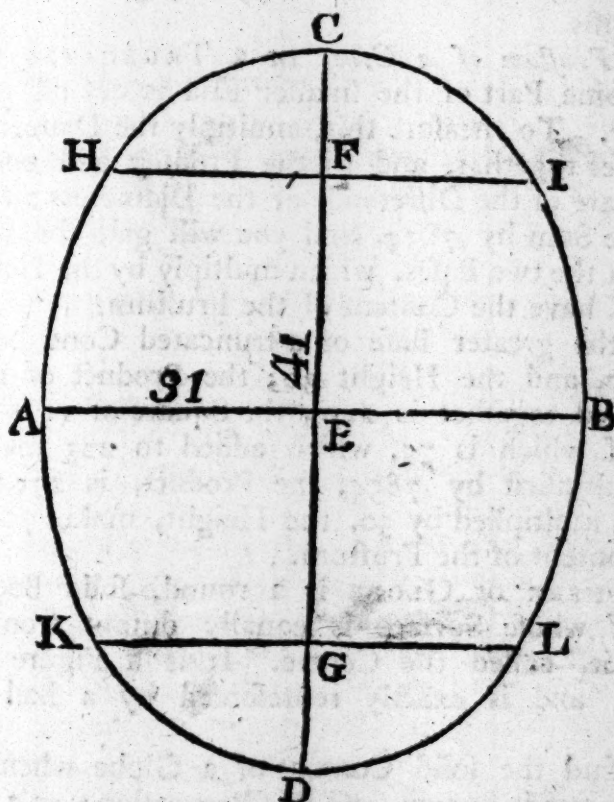
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Multiply the Area of the Base by one third of the perpendicular Height, and the Product will be the Content. Let ACB be a Cone, the Diameter of whose Base BC is 26,5 Inches, and the Height AD is 16,5 Feet; multiply the Diameter 26,5 into itself, and the Product will be 702,25, which multiply by .7854, and the Product will be 551,54715; which multiplied by 5,5, a third Part of the Height, the Product will be 3033,47825; which divided by 144, the square Inches in a Foot, the Quotient is 21,07, the solid Content of the Cone in Feet.

An **ELIPSIS**, or mathematical Oyal, is a Plane terminated by a curve Line, called the Circumference of the Ellipsis, as ACBD, and is produced from the Section of a Cone by a Plane cutting both its Sides, but not parallel to the Base. It has two Diameters cutting each other in the Center; the longest, CD, is called the



transverse Diameter, and the shortest, AB, is called the conjugate Diameter. Take half the transverse Diameter in your Compasses; that is, EC or ED; then set one Foot in

of the Compasses in A, and extend the other to the Line CD, and at the Point F, where it reaches to make a Mark, as also at G. These two Lines are the Focus's. A Line drawn through these Points from H to I, and from K to L, parallel to the Conjugate Diameter AB, is called the *Latus rectum* or *right Parameter*. These two Lines likewise are called the *principal Ordinates*. Besides, all Lines at right Angles to the transverse Diameter are called *Ordinates*.

This Figure was purposely deferred till a Cone was treated of, that it might be better understood; I shall therefore shew how to measure it. Multiply CD 41, the transverse Diameter, into AB, the conjugate Diameter 31, and the Product will be 1271. The Square Root of this is 35.65, which is the Diameter of a Circle equal to this Ellipsis; therefore multiply 1271 by .7854, as in measuring a Circle, and the Product 998,2425 is the Content of the Ellipsis.

The *Frustrum of a Cone*, or a TRUNCATED CONE, is when some Part of the smaller End is cut off parallel to the Base. To measure this, multiply the Diameter of the two Bases together, and to the Product add one third of the Square of the Difference of the Diameters; then multiply the Sum by .7854, and you will gain the mean Area between the two Bases, which multiply by the Height, and you will have the Content of the Frustrum.

Let the greater Base of a truncated Cone be 15, the lesser 10, and the Height 30; the Product of 10 and 15 multiplied together is 250; the Square of 15 is 225, one third of which is 75, which added to 225 makes 300; this multiplied by .7854, the Product, is 235.62: This Product multiplied by 30, the Height, makes 706,86, the solid Content of the Frustrum.

A SPHERE or GLOBE is a round, solid Body, every Part of whose Surface is equally distant from a Point within it, called the Centre. It is a Figure generally known, and is exactly represented by a Ball perfectly round.

To find the solid Content of a Globe when the Axis or Diameter is known, use this Proportion; as 21 is to 11, so is the Cube of the Diameter to the solid Content. Suppose the Diameter or Axis of a Globe to be 18, the Cube of 18 is 5832; then say, as 21 : 11 :: 5832 : 3054.

the solid Content of the Globe; or you may multiply the Cube of the Axis by .5236, and the solid Content will be the same.

When the Diameter and Circumference are both known, multiply them together, and the Product will be the superficial Content: Multiply this by the sixth Part of the Diameter, and the Product will be the solid Content. Suppose the Diameter to be 18, then will the Circumference be 56.57; this multiplied by 18 gives 1018.268, the superficial Content: This again multiplied by 3, one sixth of the Diameter, the Product is 3054.3 for the solid Content nearly the same as before.

All these Operations may be performed by Logarithms much more exactly, thus:

Logarithm of 22	1.34242
— — — 18	1.25527
The Sum	2.59769
Logarithm of 7 subtract	0.84510
Remains Log. of the Circumference 56.57	1.75259
Logarithm of 18	1.25527
Log. of the superficial Content 1018.26	3.00786
Logarithm of 3	0.47712
Log. of 3054.3, the solid Content.	3.48498

You may perceive by this Method the little Difference, arising from multiplying by Fractions is avoided, and that the last Product comes nearer the Truth than any other Way, besides, when you are a little used to this Method, you will find it much the easiest: But when the Numbers to be multiplied are greater than the tabular Numbers, you must proceed the common Way.

300 Of MEASURING.

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Let the greater Bafe of a truncated Cone be 15, the leffer 10, and the Height 30; the Product of 10 and 15 multiplied together is 250; the Square of 15 is 225, one third of which is 75, which added to 225 makes 300; this multiplied by .7854, the Product, is 235.62: This Product multiplied by 30, the Height, makes 706,86, the folid Content of the Fruftum.

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Of MEASURING. 301

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Of the measuring Artificers Work, such as Carpenters, Bricklayers, Joiners, Plasterers, Painters, Glaziers, Masons, and Paviments.

Of CARPENTERS Work.

CARPENTERS Work, as Flooring, Partitioning, and Roofing, is usually measured by the Square of 10 Feet long, and 10 Feet broad, so that one Square contains 100 square Feet.

The Rule is to multiply the Length by the Breadth, and to divide it by 100, and the Quotient will shew the Number of Squares. Thus if a Floor is 57 Feet 3 Inches long, and 28 Feet 6 Inches broad, how many Squares will it contain; you may remember by what has been said before, that 5 is the Decimal of one half of any Thing, 75 of three Quarters, 25 of a Quarter, and 125 of half a Quarter; then the Decimal of three Inches, a Quarter of a Foot is 25, and of six Inches half a Foot, is 5. This being considered the Work will stand thus,

$$\begin{array}{r}
 57.25 \\
 28.5 \\
 \hline
 28625 \\
 45800 \\
 11450 \\
 \hline
 1631.625
 \end{array}$$

This Product is to be divided by 100, which is expeditiously done by cutting off with a Dash of the Pen 31, the two first Figures of the Integer towards the Right Hand, and then the Answer will be 16 Squares and 31 Feet; as for the Inches, they are not regarded in this Kind of Measurements.

Suppose a PARTITION is 12 Feet 3 Inches high, and 82 Feet 6 Inches deep, what is the Content?

Of MEASURING. 303

$$\begin{array}{r}
 12.25 \\
 82.5 \\
 \hline
 6125 \\
 2450 \\
 9800
 \end{array}$$

10)10.625

The Answer is 10 Squares and 10 Feet.

In ROOFING it is a Rule among the Workmen, that the Flat of a House, that is, the Measure from Wall to Wall on the Inside, and half the Flat is equal to the Measure of the Rafters of the Roof of the same House, if it be truly proportion'd; or as the Workmen speak, if it be truly pitched: For if the Roof is more steep or more flat than the true Pitch, the Measure will be more or less in Proportion.

Suppose the Measure from the Inside of one Wall to the Side of the other is 44 Feet 6 Inches in Length, and 18 Feet 3 Inches in Breadth, how many Squares of Roofing will cover the House?

$$\begin{array}{r}
 18.25 \\
 44.5 \\
 \hline
 9125 \\
 7300 \\
 7300
 \end{array}$$

812.125 The Flat.
406 One half.

12)18. The Sum divided by 100.

So that the Answer is 12 Squares 18 Feet.

Of BRICKLAYERS Work.

TILING is measured by the Square of 10 Feet or 100, and is much the same as measuring the Roofs of Carpenters Work, only the Bricklayers must be allowed for the Eaves. They likewise require double Measure for the Hips and Vallies. The Hips are those Pieces of Timber

D d 2

304 Of MEASURING.

ber which are placed at the Corner of a Roof, and are much longer than the Rafters. The Country Workmen commonly call them Corners; some call them principal Rafters, and others Sleepers: But the Truth is, the Sleepers lie in the Vallies, and join at the Top with the Hips.

When the Gutters are allowed double Measure, the Way is to measure the Length along the Ridge Tiles, and by that Means the Measure of the Gutter will become double. It is usual also to allow double Measure at the Eaves, so much as the Projection is over the Plate, which is commonly about 18 or 20 Inches.

Suppose the Tiling of a Roof is 35 Feet 9 Inches in Depth on both Sides, the usual Allowance being made for the Eaves, and 43 Feet 6 Inches in Length, how many Squares of Tiling are in the Roof? Proceed as before.

$$\begin{array}{r}
 35.75 \\
 43.5 \\
 \hline
 17875 \\
 10725 \\
 14300 \\
 \hline
 15)55.125
 \end{array}$$

The Answer is 25 Squares and 55 Feet.

In *Walling*, the Workmen measure their Work by the Rod-Square, each Rod containing 16 Feet and a half, which multiplied into itself makes a Rod-Square, containing 272.25 Square Feet. But in some Places a Rod is 18 Feet, and then it will contain 324 Square Feet. The Standard Thickness of a Wall is a Brick and a half; when it is more, it must be reduced to a Standard Thickness, by multiplying the Superficial Feet contained in the Wall, by the number of half Bricks the Wall is thick, and then one third of the Product will be the Content in Feet so reduced.

Suppose a Wall is 72 Feet 6 Inches long; 19 Feet 3 Inches high, and 5 Bricks and a half thick, how many Rods of Brick-Work will it contain when reduced to the Standard?

19.25

Take
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Content.
Suppo
24 Feet
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Of MEASURING. 305

19.25 The Height.
72.5 The Length.

9625
3850
13475

1395.625
11 Half Bricks in Thickness.

1395625
1395625

3)15351.875

272.25) 5117.291(18
27225

239479
217800

68.06)21679(3 Quarters of a Rod.
20418

12.61

Take notice, that the Number 68.06, by which the Remainder is divided, is a Quarter of a Rod; which makes the Answer 18 Rods, 3 Quarters, and 12 Feet.

Of PLAISTERERS WORK.

PLAISTERERS Work is measured by the Yard-Square, or the Square of three Feet, which is 9 Feet. The Rule is to multiply the Feet and Inches by each other, and then to divide the Product by 9. The Quotient will give the Content.

Suppose a Cieling was 59 Feet 9 Inches in Length; and 24 Feet 6 Inches in Breath; how many Yards are contained in that Cieling?

D d 3

59.75

$$\begin{array}{r}
 59.75 \\
 24.5 \\
 \hline
 29875 \\
 23900 \\
 11950 \\
 \hline
 9)1463.875(162.652 \\
 9 \dots\dots\dots \\
 \hline
 56 \\
 54 \\
 \hline
 23 \\
 18 \\
 \hline
 58 \\
 54 \\
 \hline
 47 \\
 45 \\
 \hline
 25 \\
 18 \\
 \hline
 7 \\
 \hline
 \end{array}$$

Observe that the Decimal of one Foot of a Yard Square, or 9 Feet, is 1111, of two Feet 2222, of three 3333, of four 4444, of five 5555, of six 6666, of seven 7777, of eight 8888. So that you see 652 is nearest 666. Therefore the true Answer is 162 Yards and 6 Feet.

Note, That in measuring Walls, Deductions must be made for Doors and Windows. Likewise in rendering between Quarters, you may deduct a fifth Part for the Quarters, Braces, &c. But in whitening or colouring a fourth or fifth Part must be added, when the the Quarters and Braces project beyond the Wall.

Of JOINERS Work.

JOINERS Work is measured by the Yard-Square; but the Dimensions in taking the Height of any Room are taken

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upon
If
above
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conta

3541
Answ

OF MEASURING. 307

taken by a String, because Cornice Mouldings, and swelling Pannels cannot be measured by a strait Instrument. You must begin at the Top and girt all over the Mouldings, which will make the room much higher than it is: Whereas in measuring round the Room, they only take it as it is upon the Floor.

If a Room of Wainscoting, measured according to the above Rule, be 12 Feet 9 Inches high, and 96 Feet 10 Inches in Compass, how many Yards of Wainscoting will it contain?

$$\begin{array}{r}
 96.25 \\
 12.75 \\
 \hline
 48125 \\
 67375 \\
 19250 \\
 9625 \\
 \hline
 9)1227.1875(136.3541 \\
 9 \\
 \hline
 32 \\
 27 \\
 \hline
 57 \\
 54 \\
 \hline
 31 \\
 27 \\
 \hline
 48 \\
 45 \\
 \hline
 37 \\
 36 \\
 \hline
 15 \\
 9 \\
 \hline
 6
 \end{array}$$

3541 is the nearest three square-Feet, and therefore the Answer is 136 Yards and three square-Feet.

Ob-

Observe that Deductions are to be made for all Window-Lights; and that the Window-Boards, Soffit-Boards, and Cheeks must be measured by themselves. Likewise that for Doors, Window-shutters, and other Work that is wrought on both Sides, when it is measured, the Joiner is paid for Work and half Work; that is, when you have found the Content you must halve it, and add the half to the former Sum, which will be the Content of the Work and a Half.

Of PAINTERS Work.

PAINTERS Work is measured in the same Manner as that of Joiners, by girting over the Mouldings, and swelling Pannels when you take the Height. When this is done you are to proceed exactly in the same Method. He values his Work according to the times it is coloured over; and paints the Window-Lights, Window-Bars, and Casements, &c. at so much *per Piece*.

Of GLAZIERS Work.

GLAZIERS measure their Work by the Foot square, so that the Length and Breadth being multiplied together in Feet produce the Content. They are commonly so exact as to take their Dimensions to a Quarter of an Inch; and in multiplying Feet, Inches, and Parts, the Inch is subdivided into twelve Parts, as the Foot is, and each twelfth Part into twelve others.

Suppose a Pane or Light of Glass is 4 Feet, 8 Inches and $\frac{3}{4}$ long, and 1 Foot, 4 Inches, and $\frac{1}{4}$ broad, how many Feet will it contain?

The Decimal of 8 Inches and $\frac{3}{4}$ is .729. The Decimal of 4 Inches and $\frac{1}{4}$ is .359, as you may see in the Decimal Table of a Foot the Integer.

$$\begin{array}{r}
 4.729 \\
 1.359 \\
 \hline
 18916 \\
 23645 \\
 14187 \\
 4729 \\
 \hline
 6.403066
 \end{array}$$

So that the Answer is 6 Feet and almost 5 Inches.

Of

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Of MASON'S Work.

MASON'S Work is generally measured by the Foot, sometimes superficially, and sometimes according to the Solidity. Suppose a Pavement is 96 Feet long, and 16 Feet, 9 Inches wide, how many superficial Feet will it contain ; Remember that the Decimal of 9 Inches, or three Quarters of a Foot is .75, and then the Work will stand thus.

$$\begin{array}{r}
 16.75 \\
 \underline{.96} \\
 10050 \\
 15075 \\
 \hline
 1608.00
 \end{array}$$

So that the Answer is 1608 Feet.

Suppose a Wall to be 64 Feet, 6 Inches long, 20 Feet 6 Inches high, and 2 Feet 3 Inches thick, how many solid Feet will it contain ?

64.5 The Length.
20.5 The Height.

$$\begin{array}{r}
 3225 \\
 12900 \\
 \hline
 \end{array}$$

13222.5
2.25 Thickness.

$$\begin{array}{r}
 661125 \\
 264450 \\
 264450 \\
 \hline
 2975.062
 \end{array}$$

In some Parts of the Kingdom, Walling is measured by the Rod of 63 Feet, superficial Measure, and then the Thickness is allowed for in the Price agreed upon.

Suppose a Wall to be 89 Feet, 3 Inches long, and 15 Feet, 6 Inches high ; how many Rods will it contain of 63 Square Feet ?

89.25

$$\begin{array}{r}
 89.25 \\
 15.5 \\
 \hline
 44625 \\
 44625 \\
 8925 \\
 \hline
 63)1383.375(21 \\
 126 \\
 \hline
 123 \\
 63 \\
 \hline
 60 \\
 \hline
 \hline
 \end{array}$$

The Answer is 21 Rod and 60 Feet.

Of PAVIOURS Work.

PAVIOURS Work is measured by the Yard, so that nothing else is necessary, but to multiply the Length by the Breadth and you will gain the Content. If it was measured by the Foot, divide the Product by 9 to bring it into Yards. This is so easy, that an Example is not necessary.



Of MEASURING TIMBER.

THE Measuring of Boards is exactly the same as the Measuring a Parallelogram, before taught. Suppose a Board is 13 Feet long, and 16 Inches broad; how many Feet will it contain? Multiply 16 by 13 and the Product will be 208; divide it by 12, the Number of Inches in a Foot, and it will give 17 Feet, with 4 the Remainder, which is a Quarter of twelve, and therefore is the third Part of a Foot. Or turn 13 Feet the Length into Inches by multiplying them by 12, and the Product will be 156 Inches. Multiply this by 16 Inches, the Breadth, and the Product will be 2496. Then divide

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Of MEASURING. 311

vide it by 144, the Number of Inches in a Foot square, and the Quotient will be 17 Feet, with 48 remaining, which is the third Part of 144; the same as before.

A square Piece of Timber which has equal Bases, the Sides being straight and parallel, is the same as a *Paralelopipedon*, the Measuring of which has been taught before, and therefore needs not be repeated: I shall only give one Example in Feet and Inches.

Suppose the Side of a square Piece of Timber is 15 Inches, and the Length 18 Feet. Multiply 15 by 15 and the Product will be 225. Multiply this again by 18 Feet the Length, and the Product will be 4050. Divide this last by 144, the square Inches in a Foot, and the Quotient will be 28.125 which is just 28 Feet and half a Quarter, the solid Content. When the Timber is broader than it is deep, multiply the Depth, Breadth and Length together, dividing the Product by 144, and you will have the Content.

Tapering Timber, by some called *unequally squared Timber*, is properly the *Frustum of a Pyramid*, or a truncated Pyramid. The measuring this has been before taught; but an Example in Feet and Inches will make it more plain.

Suppose a Piece of Timber, the Side of whose Square is 25 Inches at the greater End, and 9 Inches at the lesser End, the Length being 20 Feet.

625 The Square at the End.

81 The Square at the other End.

 50625 Product.

225 Square Root of it.

706 Content of both Bases added.

 931 Sum

6.6666 One third of the Height.

5586

5586

5586

5586

5586

 144)6206.6046(43.1014 Quotient.

576

 446

432

 146

144

 204

144

 606

576

 30 Rem.

The Answer is 43 Feet and a little more than one Inch, which may be neglected.

The Base of round Timber is the same as a Cylinder, the Measuring of which has been already shewn. In this Case it is common to put a string round to find the Girt. which is the Circumference, and from that Circumference you may find the Diameter. See *Cylinder*. But there is another Way to measure the Content or Area of the End which I shall now shew. Square the Circumference or multiply it into itself, which is the same Thing. Then multiply the Product by .07058, and that will give the Content or Area. Multiply this Area by the Length of the Timber

Of MEASURING. 313

and the Product will shew the Length of the Whole; which may be reduced into Feet by dividing the said Product by 144.

Suppose the Girt of a Piece of round Timber is 96 Inches, and the Length 18 Feet, proceed thus:

96

96 the Girt or Circumference

576

864

9216 the Product

.07958 Multiplier

73728

46008

82944

64512

733.40928 the Area

18 Length

586727424

73340928

13201.36704 The Product

144)13201.36704(91.67616

1296

241

144

973

864

1096

1008

887

864

230

144

864

864

0

E e

The

314 Of MEASURING.

The true Answer 91 Feet and .67616 Decimals of a Foot.

Note, After 91.67 was in the Quotient, there was no Occasion to proceed farther. But I was unwilling to stop short, lest it should be looked upon as a Neglect.

Tapering round Timber, that is round Timber with unequal Bases, is to be measured exactly in the same Manner as the Frustum of a Cone, which it properly is. But as that depended on the Diameter, I shall now shew how to perform it by the Girt or Circumference. The Rule is to subtract the lesser Diameter from the greater, and to square the Difference. Add one third of this to the Circumferences or Girts multiplied together, and the Sum will be the mean Circumference squared. Multiply this Sum by .07958, and the Product will be the mean Area. This multiplied by the Length of Timber gives the solid Content.

Suppose the Circumference of a Piece of Timber, at one End, to be 136 Inches, and at the other 32 Inches, the Length being 21 Feet; how many Feet of Timber will it contain? See this Sum worked in the following Page.

136 Feet

136 F
32 S
—
272
408
—
4352 P

Of MEASURING. 315

136 First Girt	136	
32 Second	32	
272	104	Difference of the Girts
408	104	

4352 Product	416	
	1040	
	10816	The Square

3605.333		One third of the Square
4352.		Product of the Girts added

7957.333		Square of the mean Girt
.07958		Common Multiplier.

63658664
 39786665
 71615997
 55701331

633.24456014 Mean Area
21 the Length

63324456014
 126648912028

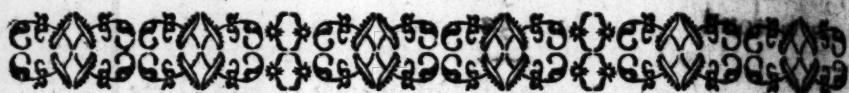
13298.13576294 Solid Content
 144)13298.13(92.34
 1296

338
 288

501
 432

693
 576

117
 The Answer is 92.34 Feet.
 E e 2



Of SURVEYING.

THE Art of surveying or measuring Land, and the laying it down in a Draught or Map, so as to determine the Content in Acres, Rods, &c. require the Use of several Instruments, such as the *Plain Table*, the *Theodolite*, the *Semi-Circle*; a *Compass*, a *Chain*, and a *Protractor*.

The *Plain Table* is a Board about 15 Inches broad, and 12 long, surrounded with a Frame: There is a Brass Center in the Middle, from which are projected 360 Degrees, that is, all the Degrees of a Circle. Every 10th Degree is number'd both Ways, to save Substraction. On the other Side it is usual to project a Semicircle, divided and number'd in the same Manner; that is, 180 Degrees numbered both Ways. A Compass is generally fitted to this Table to set it North and South, and a Ruler and Index with Sights. This Table is fixed to a three-legged Stand by a Ball and Socket, on which it may be readily turned round, and then fixed to a Point with a Screw. But this and the other Instruments may be better known by viewing them in the Shop of a Mathematical Instrument-Maker, than by any Description that can be given.

There are two Sorts of *Chains*, but that called *Gunter's Chain* is most in Use. It contains 4 Poles, or 66 Feet: It is divided into 100 Links, each Link containing 7.92 Inches.

The *Protractor* is an Instrument made of Silver or Brass with a Semicircle or Limb, divided both Ways into 180 Degrees, subtended with a Diameter, in which is a little Notch to be used as a Center.

There has been so much already said about the Dimensions of plain regular Figures, that it needs not be here repeated. But there are few Pieces of Ground of so simple a Form, and therefore in measuring a Field it will be necessary to reduce it into Triangles, for the Sake of a more certain and easy Measurement. The most common

Figure

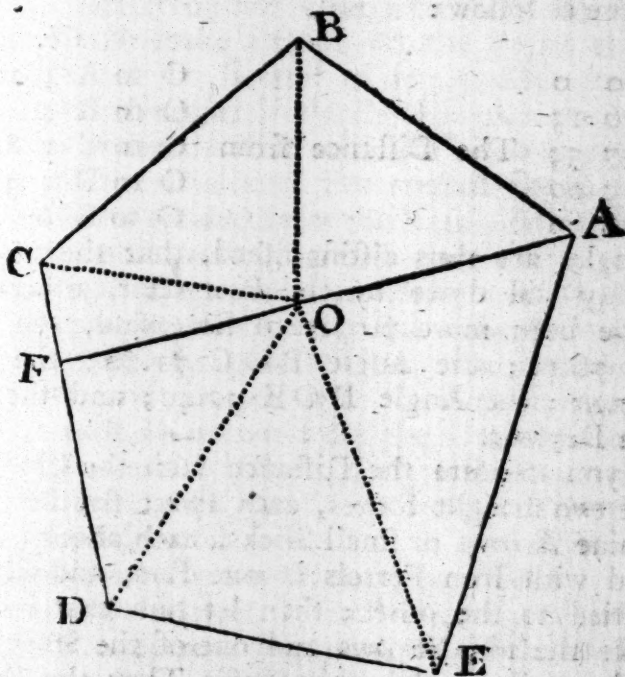
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Instrum
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Table,
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Eye; so
Mark t

Of SURVEYING. 317

Figure of a Piece of Land is a Trapezium, consisting of four unequal Sides and four unequal Angles: However, there are some Fields which consist of 5, 6, 7 Sides, or more, and though these Sides are measured ever so exactly, it will not be sufficient without knowing the Angles.

Suppose A B C D E to be a Field, the Plot of which is to be taken; choose a Spot near the Middle of it, from whence all the Corners or Angles of it are to be seen; place Marks in every Angle that may be plainly distinguished: If all the Angles cannot be seen from one Station, place upright Poles at those Angles that require it, and that will save you the Labour of making Observations at two Stations; then with a Theodolite, having telescopic Sights, which is best, or with the Plain Table, prepare to take the Angles from your Station; fix your



Instrument at the Station O, taking Care that the fiducial Edge of your Instrument passes through the Center on the Table, cutting it perpendicularly at 360 and 180 Degrees; then turn about the Table on the Staff-Head till you see the Angle or Corner A, taking Care that 180 is next your Eye; screw it fast, and then looking backwards, cause a Mark to be set up in the Line C D, at the Point F, that

E e 1

you.

you may be sure the Instrument is kept firm from moving during the Work : And now the Line A O F passing on the Land from the Angle A, directly under the Sights of the Instrument, to the Mark at F, is the prime Diameter from whence the Degrees of the Angles are to be numbered ; and accordingly you are to mark the Angle A with 360 Degrees in your Field Book ; then you turn the Index till you see B, keeping it in a due Position. If you make Use of a Telescope, till the Hair therein cuts the Mark at B, and the Edge of the Index, we will suppose, cuts the Frame at 76 Deg. 15 Min. which I set down for the Angle A O B, then turn the Sight to C D and E, and set down the Angles.

This done, you must measure the Distances from the Station to each of the Angles. These and the Angles suppose to be as follow :

			<i>Ch.</i>	<i>L.</i>
A	360	o	O to A	4 20
B	76	15	O to B	4 3
C	157	35	O to C	3 84
D	225	20	O to D	5 35
E	278	o	O to E	6 6

The Distance from

The Angles are thus distinguished, that they may be more readily laid down by the Protractor, otherwise it would have been more proper to have said, the Angle A O B is 76.15 ; the Angle B O C 71.20 ; the Angle C O D 67.45 ; the Angle D O E 52.40 ; and the Angle E O A 82 Degrees.

When you measure the Distance with the Chain, you must have two straight Staves, each about five Feet long ; likewise nine Arrows or small Sticks, each about two Feet long, shod with Iron Ferrols at one End, and Pieces of red Rag tied to the other ; then let him that leads the Chain take the nine Arrows and one of the Staves, likewise he that follows the other Staff : Then the Follower remaining at the Station, the Leader must proceed with the Chain towards A, or any other Angle, the Follower taking Care that he proceeds in a right Line towards the Mark at A. This done, let the Leader fix his Staff at the End of the Chain in the same right Line, that the Follower may see whether he is exact or not ; if he is, let him take up the Staff and fix one of the Arrows in its Place,

Place, measure

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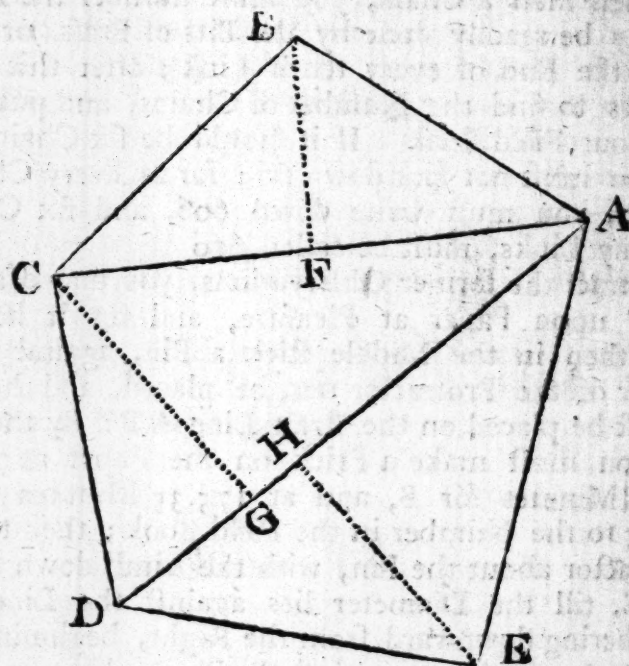
Place, proceeding in the same Manner till the Whole is measured, leaving an Arrow at the End of every Chain.

When you are come so near the Mark at A as to be in Distance less than a Chain, you must number the Links, which may be readily done by the Bits of Brass, or other Marks at the End of every tenth Link; after this count the Arrows to find the Number of Chains, and put them down in your Field Book. If it should be six Chains, six Links, you must not put down 66; for as every Chain is 100 Links, you must write down 606, and six Chains, without any Links, must be called 600.

To protract the former Observations, you may draw the Line A F upon Paper at Pleasure, and let it be long enough; then in the Middle stick a Pin, against which the Center of the Protractor may be placed, and the strait Line must be placed on the strait Line A F: By the Help of this you must make a Prick on the Paper at 76 Degrees 15 Minutes for B, and at 175.35 Minutes for C, according to the Number in the Field Book; then turning the Protractor about the Pin, with the Limb down toward D and E, till the Diameter lies against the Line A F, and numbering downward from the Right, beginning with 190, 200, &c. and over-against the Place where 225 Deg. 20 Min. and 278 Deg. 50 Min. fall, you must prick the Paper at the Side of the Limb: But if the Protractor has only 180 Degrees, you must subtract 180 from the afore-said Numbers, and proceed with the Remainders. This done, Lines must be drawn from the Center through the afore-said Points, upon which, by Help of a Diagonal Scale, I prick down the Chains and Links from the Center, and then draw Lines from A to B, B to C, and so on. This done, you will have the true Plot of the Field.

To obtain the Content it must be reduced into Triangles, as in the adjacent Figure A B C D E, by drawing Lines from one Angle to another; and then you will have ABC, ACD, and ADE, letting fall the Perpendiculars BF, CG, and EH. Now if your Plot is carefully and truly drawn, you may measure the Diagonals and Perpendiculars, and proceed to find the Content of each Triangle. Thus the Diagonal AC is 796; the Diagonal AD 898; BF 316; CG 452; and EH 420: Then multiply the whole Diagonal by half the Perpendicular, and you will have the Content of each Triangle. Thus AC 796, multiplied

multiplied by 158, half BF, and the Product will be 122768; and AD 898 by 226, the half of CB, and the Product will be 202948; likewise AD 898 by 210, the half of EH,



and the Product will be 188580; add these together, and the Sum will be the Content of the whole in Links thus:

122768

202948

188580

514296 Links

But it is observable that in all Trapeziums some of this Labour may be saved; So here if the Triangle ABC be taken from the Figure, the Remainder is ACDE. In which Case both the Perpendiculars will fall on the same Base; therefore add CG and EH together, and take one half of the Sum, which multiply into the Diagonal AD, and the Product will be the Content of the Trapezium.

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Of SURVEYING. 321

C G	452	
E H	420	
Sum	872	
Half	436	
Diagonal A D	898	
	3488	
	3924	
	3488	
Product	3.91528	
	1.22768	Content of the other Triangle.
	5.14296	Acres and Parts.
	4	
	.57184	Parts of a Rood.
	40	
	22.87360	Poles and Parts.

The Reason of this Operation will appear plainly, if it be observed that *Gunter's Chain* contains four Statute Poles, or 100 Links, so that any Number of Chains is so many hundred Links, as five Chains is 500, six Chains is 600, &c. likewise 160 Statute Poles is an Acre, each Pole being 16 Feet and a half. There is also 16 square Poles in a Chain: If therefore you divide the square Poles in an Acre by the square Poles in a Chain, the Quotient will be 10, the square Chains in an Acre: Multiply 100, the Chain into itself, and the Product will be 10000, the Links in a square Chain. Multiply this by 10, the square Chains in an Acre, and the Product will be 100000, the square Links in an Acre.

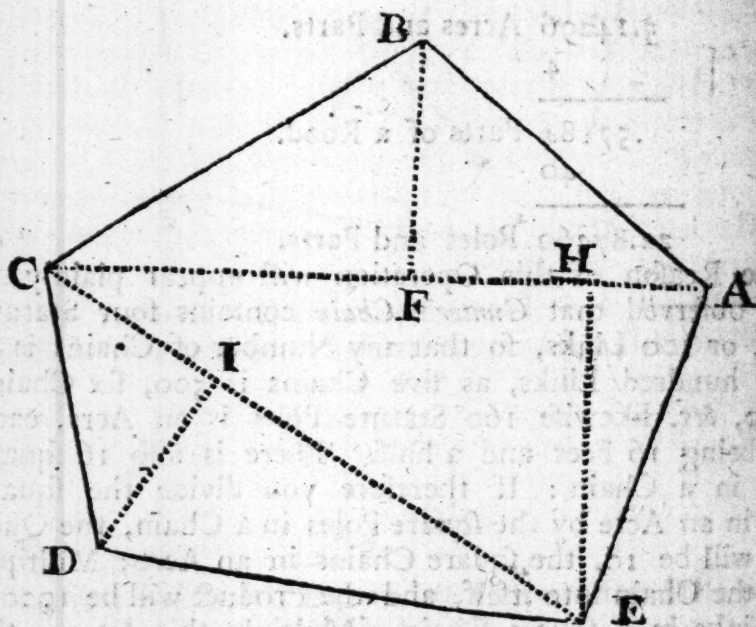
Now as there are 391528 Links in the Content of the Piece of Ground, if you divide them by 100000, the square Links in an Acre, which is done by cutting off five Figures towards the Right Hand, the Number of 0's in 100000, the Quotient will be five Acres, and 14296 Parts; If these Parts are multiplied by 4, the square Roods in an Acre, and then cut off five Figures to the Right, those to the Left will be Roods; multiply these Parts by 40, the

322 OF SURVEYING.

the Square Poles in a Rood, and from the Product cut off five Figures as before, and the Remainder will be Poles: Thus in the preceding Sum there are five Acres and 22 Poles, but no Rood. If you are desirous of proceeding farther, it may be done by the Help of the Table of square Measure, Page 99.

To take a Plot of a Field by measuring round it.

Let A B C D E be the Figure of a Field to be surveyed, and whose Plot is required, in order to which the Sides and Angles must be all measured. You may begin at any of the Angles: Suppose at A. Having prepared your Instrument, turn your Index about till you see the



Angle at B, and then fix it fast; then turn the Sights to E, and observing how many Degrees it cuts, set them down in your Book; then remove your Instrument to B, and observe that Angle in like Manner, proceeding afterwards to the rest; then with your Chain measure the Sides A B, B C, C D, D E, E A, setting them down as they are measured. When you have done all, the Work will stand thus:

Angles.

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and the
To
Side A
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then la
the Cer
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to B, k
number
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A towar
A B; af
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Angles,
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Of SURVEYING.

323

Angles.	Deg.	M.	Sides.	Ch.
E A B	113	30	A B	546
A B C	106	30	B C	638
B C D	111	0	C D	412
C D E	111	0	D E	710
D E A	100	30	E A	524

Some make a Distinction between Chains and Links, but it is unnecessary, because the Hundreds are always Chains, and the Overplus Links.

To protract these Observations, take the Length of the Side A B in your Compasses from the Scale, and make two Pricks on your Paper, between which draw a Line; then lay the Diameter of your Protractor upon it, with the Center at A, and numbering the Degrees from the Right to the Left, make a Prick upon your Paper at $113^{\circ} 30'$, for the Angle E A B; then remove the Center to B, keeping the Diameter still upon the Line, and then numbering the Degrees from the Left to the Right, make a Prick at $106^{\circ} 30'$, for the Angle A B C, draw an obscure Line from the Point A towards E, and another from A towards B, on which set off the Measures for A E and A B; after which draw them with Ink. Proceed in the same Manner to the rest. If this is accurately done, you may safely take the Measure of the other necessary Lines with your Compasses.

To measure it, draw the Lines A C and C E from the Angles, A C is 950, and C E is 948; then let fall the Perpendiculars B F, D I, and E H; B F is 354, D I is 298, and E H is 496. See the Example in the following Page.

DI

324 Of SURVEYING:

DI 298

EH 496

CE 948

Sum 794

397 Half the said Sum.

Half 397

6636

8532

2844

376356 Content of the Trapezium ACDE.

AC 950

Half BF 177

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6650

950

168150 Content of the Triangle ABC.

376356

5,44506 Acres and Parts.

4

.78024 Parts of a Rood.

40

31.20960 Poles and Parts.

The Content is 5 Acres and 31 Poles.

If the boundary Lines are not strait, the Pieces of Land without the Lines must be reduced to Parallelograms, or Triangles, in the best Manner you can; and when the Contents are obtained, you must add them to the former Sum to complete the Whole.

These two Methods are sufficient to find the Number of Acres in any Field, and this last is generally preferred before any other, as being less liable to Error. If the South or North Part of the Field is required, you must take the Situation of it by a good Compass, making Allowance for the Variation of the Needle.

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Observations on measuring Land in common Fields.

When plough'd Lands in common Fields are to be measured by the Chain, it is usual to measure the Length down the Ridge, and to take the Breadth at the Top, in the Middle, and at the Bottom, and then adding these three Numbers together, to take one Third of the Sum for the mean Breadth; but it is by no Means adviseable to take the Breadth of the Land very near the Top or Bottom, because the Turning of the Plough generally makes it broader or narrower: And if in measuring the Breadth down the Land you find considerable Variations, it will be best to measure cross the Lands oftener, and adding the several Sums together, to divide the whole by the Number of those Sums; that is, if you have measured it six Times, you must divide the whole by 6, and the Quotient will give the mean Breadth.

The several Furlongs in common arable Lands, may be accounted as so many particular Inclosures, and measured after the same Manner, by setting up Marks at the Extremities of the Furlongs, and measuring the Angles by the Theodolite or plain Table; and as you pass along the Station Lines, you may from thence take the Off-sets to each Man's particular Lands, and against the Off-sets write the Name of the Owner or Tenant, adding the Buttings and Boundings in your Draught.

Note, That in the Survey of a large common Field, it will be safer to divide it into Parcels, as separate Fields, keeping good Marks at the Stations, than to venture the closing of a Plot by going round it all at once, and dividing it into Parcels afterwards.

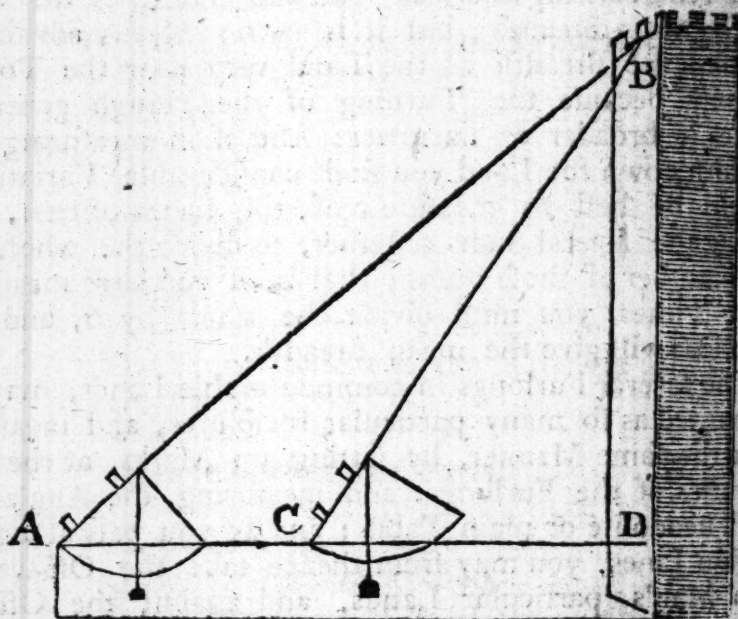
Of taking Heights and Distances.

Any Height may be taken with Gunter's Quadrant by the Square near the Centre at one Observation, if there is free Access to the Foot of it. In this Case you have nothing to do but to approach nearer to it, or to go back from it till you see the Top of a Tower or other Place through the Sights, and the Thread falls exactly along the Diagonal of the Square, or which is the same Thing, cuts the Limb of the Quadrant at 45 Degrees; and then

326 Of SURVEYING.

the Height of the Place above the Eye will be equal to the Distance of the Place from the Eye horizontally: Therefore measure the Distance from the Station to the Foot of the Object, to which add the Height of the Eye, and you will have the true Height without farther Trouble.

Suppose BD, the Height of the Tower, I mean that Part of the Tower at D that is level with the Eye; go



backward or forward till the Thread falls on 100 in the Square, or 45 Degrees of the Limb, and then BD will be equal to AD, whatever the Measure of AD may be: But if any Thing prevents you from going so far back from the Tower as to gain an Angle of 45° , you may take an Angle of 60° , and then the Height of the Tower will be double the Distance from the Tower.

When you cannot come to the Foot of the Tower, by reason of Water, or some other Impediment, it is called an inaccessible Height, and the proper Way to measure it will be by taking the Angles at two Stations, and then by measuring the Distance between those Stations. Suppose the Angle BAD 45° , the Angle BCD 67° , and the Distance between A and C 500 Feet: Now as the Angle BCD is 67, the Complement to 90° is 23° , the Angle CBD, and the Complement of the Angle at A is 45° , the Angle

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OF SURVEYING. 327

Angle ABD; now if the lesser Angle at B 23° is taken out of the greater 45° , the Remainder will be 22° , the Angle ABC. This done, we must first find the Side BC thus,

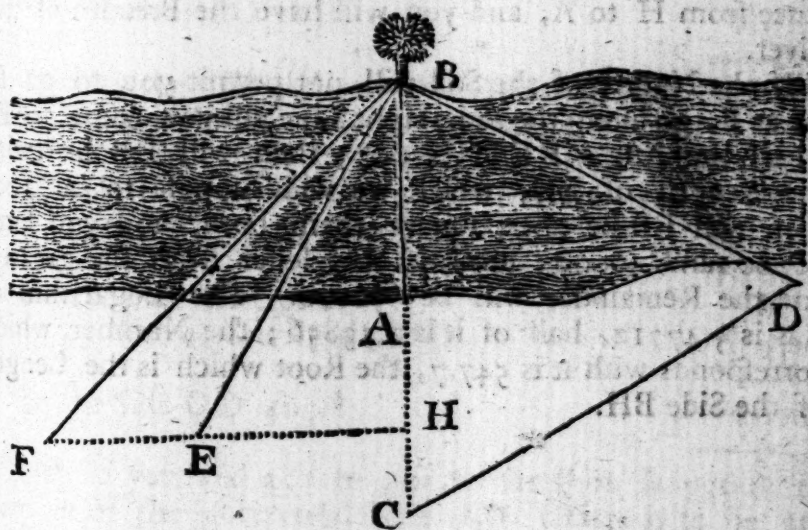
As the Sine of the Angle ABC 22°	0.42643
To the Side AD 500 Feet,	2.69897
So is the Sine of the Angle BAC 45°	<u>9.84948</u>

To the Side AC 243.8	2.97488
To find the Height of the Tower use this Proportion,	
As the Radius	10 00000
To the Side AB 943.8	2.97488
So is the Sine of BCD 67°	<u>9.96403</u>

To the Side BD 868.6 2.93881
 which with five Feet, six Inches for the Height of the Eye, makes 874, the Height of the Tower.

To measure the BREADTH of a RIVER.

Let AB be the Breadth of a River that is to be measured. You must drive a Stake or Arrow at A, and then choose a commodious Place in the same right Line, as at C, then another at some Distance, and by the River Side as at D; then measure the Distance from C to D, which



suppose to be 125 Feet, then with a Theodolite take the Angle B C D 73° , and the Angle B D C 58° , add these together, and the Sum will be 131° ; subtract this from 180° , and the Remainder will be 49° , the Angle at B, Then say,

As the Sine of the Angle at B. Comp. Arith.	0.12222
To its opposite Side-C 125,	2.09691
So is the Sine of the Angle at D	9.92842

To the opposite Side BC 140.5
Subtract the Distance from A to C 52, and the Remainder will be A B 88.

As you are at Liberty to make the Angle C of what Magnitude you please, let it be 60° , and then carry on a strait Line towards D, till the Angle BDC is 60° , and the Triangle B C D will be equilateral; so that you have nothing to do but to measure C D, and then you will have the Line BC, from which subtract 52 as before, and you will have the Breadth of the River. The annexed Triangle B C D is of this Kind.

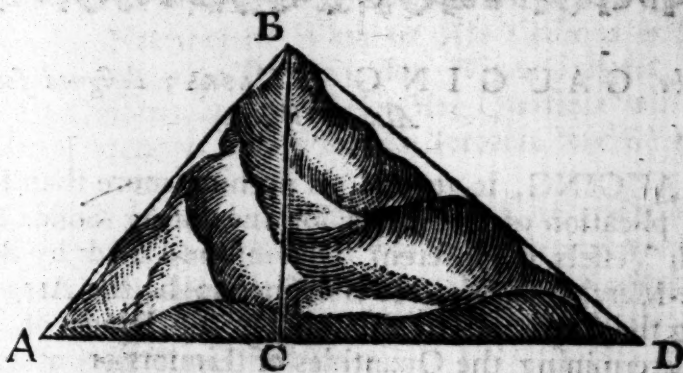
Otherwise you may make B H F a right Angle, and then go forward along the Line to F, till B F H is an Angle of 45° ; in which Case FBH will also be an Angle of 45° , and the Triangle FBH will be an Isosceles; in-so-much that measuring from H to F, 548 Feet, you will have H B of the same Length; then subtract the Distance from H to A, and you will have the Breadth of the River.

If the Nature of the Soil will not permit you to go so far as F, go along the same right Line till you come to E, where the Angle B E H is 60° ; then will E B be twice the Length of E H, which we will suppose to be 100, then will E B be 200; square them both, and you have 10000 and 40000; subtract the lesser from the greater, and the Remainder will be 30000. The Logarithm of this is 5.47712, half of it is 2.73856; the Number which corresponds with it is 547.7, the Root which is the Length of the Side B H.

Of SURVEYING. 329

To find the Horizontal Line of a Hill or Mountain.

Let ABD be the Hill, then set a Mark on the Top at



B, equal to the Height of the Instrument that is fix'd at the Foot of the Hill, from whence you are to make your Observation ; take the Angle BAC, which we will suppose to be 50° ; then consequently the Complement to that, 40° will be the Angle ABC ; then measure from A to B, which is 340 Feet. This done, the Method of finding A C, and Part of the Line A D, is by the following Analogy.

As the Radius	10.00000
To the Side A B 546	2.73719
So is the Sine of the Angle at A 50°	9.80807
To the Side AC 351	2.54526

Now as the Hill descends on the other Side, you must fix a Mark at the Bottom, and directing the Sights to that Mark take the Angle CBD 50° ; consequently the Angle CBD will be 40° ; then measure down the Hill to C, and you will find it 631.2 ; which done say,

As the Radius	10.00000
To the Side BD 631.2	2.80019
So is the Sine of the Angle CBD	9.80807
So the Side C D 405.8	2.60826

Now if you add 351 to 405.8, the Sum is 756.8, the Length of the Horizontal Line AD, which is to be protracted when you take the Plot of a Field.



Of the GAUGING of CASKS; designed for Beer, Ale, or Wine.

GAUGING, in general, is nothing more than the Application of the Rules for measuring Solids to particular Vessels of different Dimensions, used by Brewers, Wine-Merchants, &c. It is defined to be the Art of measuring the Capacities or Contents of all Kinds of Vessels, and determining the Quantities of Liquors or other Matters contained therein. It is comprehended under that Branch of the Mathematics called STEREOMETRY, because the Capacities of all Kinds of Vessels used for Liquors are cubical, parallelopipedal, cylindrical, spheroidal, conical, &c. and are computed as though they were in Reality solid Bodies. The Vessels most usually gauged are Pipes, Kilderkins, Hogsheads, Barrels, Runlets and Casks; as also Backs, Coolers, and Vats.

The Vessels in the shape of a Cube, Parallelopipedon, and Prism, may be found by multiplying the Area of the Base by its perpendicular Height, as has been before taught. Casks of the usual Form, such as Hogsheads, Kilderkins and Pipes, may be considered as the Segments of a Spheroid cut off by two Planes, which brings them to *Oughtred's Theorem* for measuring Ale and Wine Casks, which is this; add two Thirds of the Area of the Circle at the Bung, to one Third of the Area of the Circle at the Head, and then multiply the Sum by the internal Length of the Cask, the Product is the Content of the Vessel in cubic Inches.

Suppose the Diameter at the Head of a Vessel to be 18 Inches, and at the Bung 32, and the Length 40 Inches, then for the Circumference of the Head say, as $7.32 :: 18 : 58.57$. The half of 58.57 is 29.285; this multiplied by 9, half the Diameter, produces 263.565, for the Area at the Head, one Third of which is 87.85. For the Circumference at the Bung say, as $7 : 2 :: 32 : 100.57$. The half of 100.57 is 50.28, which multiplied by 16, half the Diameter, produces 803.48 for the Area at the Bung. Two

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Thirds of this Area is 535.66 which added to 87.85 makes 623.51, which multiplied by 40, the Length, the Product is 24930.40 the Content of the Vessel in cubic Inches.

To find the Number of Wine or Ale Gallons it contains, divide 24930.40 by 231 for Wine Gallons, and 282 for Ale Gallons, and the respective Quotient will give the Number, namely, 107.9 for the former, and 88.4 for the latter.

But the usual Method of gauging is by *Everard's Sliding Rule*, which is made of Box, and is a Foot and an Inch long, with two small Scales to slide in it, one of which being drawn out to the Right Hand, and the other to the Left, will make it near three Feet long.

The Lines on this Rule are two of *Gunter's Lines*, or Lines of Numbers, marked with the Letter D, beginning at the End of the Rule towards the Left Hand, and from thence continued to the other End. A, B, and C are called *double Numbers*, each being two Lines or Radius's of Numbers. The Line is called *triple Numbers*, having three Radius's of Numbers. On the Line A are four Bra's Center Pins, two in each Radius; one in each of which is marked MB, to show that 21050.42, the Number it is set against, is the Cubic Inches in a Malt Bushel. The other two are marked with A to shew that 282, the Number they are set against, is the cubic Inches in an Ale Gallon.

Close to the Figure 7 in the first Radius, on the same Line is a Dot, marked *se*, set exactly over-against 707, denoting 707 to be the Side of a Square inscribed in a Circle, whose Center is Unity. Close to 9 is another Dot, marked *se*, set over 886, which is the Side of a Square equal to the Area of a Circle, whose Diameter is Unity. Another Dot nigh W is set over 231, the cubic Inches in a Wine Gallon; and another near C is set over 3.141592, the Circumference of a Circle whose Diameter is Unity.

The Line MD, signifying *Malt Depth*, is nothing else but a Line of Numbers in a reverse Order, the Number 1 being set directly against MD on the first Radius, and is useful to cast up Malt Gauges. On the Line D there are four Center Pins; the first, marked WG, is the Gauge Point

Point of a Wine Gallon; that the Diameter of a Cylinder, whose Height is one Inch, and Content 231 cubic Inches, or a Wine Gallon, which is 17.15 Inches: The second Center Pin, marked A G, stands at the Gauge Point for an Ale Gallon, which is 18.95 Inches: The Third, M S, stands at 46 3, the Side of a Square, whose Content is equal to a solid Bushel: The fourth M R, is the Gauge Point for a solid Malt Bushel, which is 52.32 Inches.

The two Lines of Segments are each numbered from 1 to 100. The first is for finding the Ullage of a Cask, taken as the *Middle Frustum* of a Spheroid, lying with its Axis parallel to the Horizon; and the second to find the Ullage of a standing Cask. On one of the narrow Sides, noted *e*, is a Line of Inches, numbered from 1 to 12, and each subdivided into 10 Parts. A Line, by which, with that of Inches, we may find a mean Diameter for a Cask in the Figure of the Middle Frustum of a Spheroid. A Line for finding the mean Diameter of a Cask in the Figure of a Middle Frustum of a parabolic Spindle. A Line for the third Variety, which is of a Cask of the Figure of two parabolic Conoids, abutting on a common Base.

On the other narrow Side marked *f*, is a Foot, divided into equal Parts, marked F M: A Line of Inches noted I M; a Line, F C, for finding the mean Diameter of the fourth Variety of Casks, which is the middle Frustum of two Cones, abutting on a common Base. On the Back Side of the sliding Piece is a Line of Inches from 13 to 36, when the two Pieces are put Endways; and against that the corresponding Gallons, or hundred Parts, that any small or like open vessel from 13 to 36 inches Diameter will contain at one Inch deep.

The use of this Rule is very great in Arithmetic, as well as Measuring; but I shall only mention one at present, particularly the Area of a Circle, which may be readily found by the Help of the fixed Numbers called the *Gauge Point*. These Numbers are Diameters of those Circles, whose Content at one Inch deep is equal to the respective Gallons to which they belong. They are the Square Root of the Divisions last mentioned; that for A G 18.95; for W G 17.15 on the Rule: Thus, set 18.95, the Gauge Point for Ale Gallons, upon D, to 1

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upon C, then against any Diameter upon D you have the Area upon C. *Note*, when the Area of any Circle is sought in Ale Gallons, if the Diameter be more than 18.95, and less than 100, set the Gauge Point upon D to one upon C; but when the Gauge Point is less than 18.95, or more than 100, then set the Gauge Point the Middle upon C. Lastly, to find any Part of the Area, set the Gauge Point to $\frac{1}{2}$, $\frac{1}{3}$, or any other Part of 1; then against the Diameter you have the like Part of the Area.





THE GARDENER'S CALENDAR.

JANUARY.

Things to be done in the KITCHEN GARDEN.

WHEN the Weather happens to be mild, you must dig your Ground for planting and sowing in the following Months, in order to procure early Crops; that is, you must dig and trench your Grounds, and in warm Borders, near Walls and Hedges, you may sow early Radishes, Spinage, Lettice, Carrots, and small Salading, as also *Windsor* and *Sandwich* Beans.

When the Ground, by reason of Frost, is unfit for digging, dung the Ground, rub out and clean the Seed, and repair Hedges: Likewise make all your Tools ready against the Thaw, for as soon as this happens there is no Time to be lost.

Make hot Beds for the sowing of early Cucumbers and Melons; as also for Asparagus, and in another three Weeks after for the same; you should likewise prepare moderately hot Beds, and then sow Cresses, Mustard, Turneps, and other small salad Herbs; to preserve them, arch the Bed with Hoops, and cover them with Mats, if you have no Frames to spare.

When the Weather is open, and the Ground not too wet, earth up Celery, as near the Tops as possible, to blanch it. In a very hard Frost, cover the Drills of Celery, and the Ridges of Endive with loose Litter to keep it out of the Ground, that the Plants may be taken up when wanted. Likewise in dry Weather draw up the Earth to your early Pease and Beans, to keep them from being hurt by the Frost. Mushroom Beds must be covered with long fresh Straw to preserve them from Frost, and keep them from Wet.

In mild Weather transplant the shortest Endive Plants, and fullest of Leaves, to sloping Borders, that the Wet

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may run off, and let them stand for Seed. Pull off the decayed Leaves of Colliflower Plants which are under Frames, and give them as much Air as possible in mild Weather. If any Cucumber or Melon Plants are come up, give them Air at every Opportunity, with great Caution, and keep the Beds in equal Heat. Remember that they will not bear too much Air.

When a severe Frost has destroyed your Colliflower Plants, sow some Seeds on a moderately hot Bed as soon as the Season will permit, to supply their Place, and you will have good Heads in a Fortnight or three Weeks after those which were raised in *Autumn*. Likewise Cabbage Plants may be raised in the same manner.

Asparagus Buds will now begin to appear in Beds made the last Month, which must be earthed over the Crown of the Roots the full Thickness, that is, five or six Inches at least, and the Frames should now be put over them. If the Heat of the Bed begins to decline, add some hot Dung round the Sides, which will restore the Heat. Cover the Glasses with Mats and Straw every Night and in bad Weather.

Transplant Parsnips, Leeks, and Cabbages for Seed; but hang up the Cabbages three or four Days to drain, and plant them near a Wall, Pales, or a Hedge, to defend them from the Wind. At the latter End of the Month transplant some of the Sugar-Loaf Kind of Cabbage Plants, first sowing the Ground with Spinage before they are planted.

In the Beginning of the Month make some gentle hot Beds for Tansy and Mint, and they will be fit for Use in *February* and *March*. When the early Carrots and Radishes, sown on Borders, have been destroyed by the Severity of the Weather, when it is mild, sow on gentle hot Beds to supply the Table in the Spring. These Beds must be earthed eight Inches deep for the Roots to run down. Likewise sow more Seed in warm Borders, in the open Air.

Transplant Endive into Trenches to blanch it; lay the Trenches slopewise that the Wet may run off, and put the Endive on the Side of the Ridge towards the Sun, and about six Inches from the Top of the Ridge. Thrust the Plants horizontally into the Earth, almost to the Extremity of their Leaves.

This

This is a proper Time to destroy Snails and other Vermin, which are laid up in the Holes of Walls, and under Reed Hedges, for they may be easier taken out.

Towards the End of the Month, if the Weather be mild put some Pease and Beans into the Earth for a fresh Supply when the former are gone. Likewise sow Spinage, Carrots and Lettice of the common, or of the brown Dutch Sorts, on warm Borders.

Things to be done in the FRUIT GARDEN.

The Roots of all new planted Trees must be covered with Mulch to preserve them from the Frost; and the Fig-Trees against Walls, Pales, or Espaliers, should be cover'd with Mats or Reeds, which will not only preserve but hasten the Fruit, and enlarge the Quantity. The Autumnal Figs, if any, must be all taken off: When the Weather becomes warm, the Coverings must be removed gradually.

Cut off all dead or cankered Branches from the standard Fruit-Trees; but take care it may be done smooth, that the Wet may run off. If the Weather be mild you may prune dwarf Trees, and hardy Fruit-Trees, as Pears, Apples, Vines, Gooseberries, Currants, and Raspberries. In moist Weather clean your Fruit-Trees from Moss, scraping it off with an Iron Instrument made hallow to fit the Branches of the Trees; if they are too sharp they will wound the Bark.

In mild Weather cut Grafts of all Sorts of early Fruit Trees, and lay them in the Earth under a dry Wall or Pales. In hard Weather cover them with Litter or Straw; this is done to prevent the Buds from swelling too much, therefore it may be done sooner or later, according as the Tree is disposed for budding.

If you design to plant Fruit-Trees the succeeding Month make Borders, and lay a good Quantity of fresh Earth therein, making it level. You may repair the Borders of old Fruit-Trees with fresh Earth and Dung that is quite rotten, otherwise it will do more Harm than Good. Where the Ground is cold and moist, old Melon or Cucumber Beds will be most proper; but then hot Cow Dung is the best; if that is not to be had, rotten Hog's Dung. When the Trees are old, it should be laid at ten or twelve Feet Distance from the Body of the Tree.

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If the Espaliers are decay'd, mend them with new Poles, and fasten them where they are loose with Wire; tie the Branches of your Fruit Trees thereto with Ozier Twigs, taking Care not to pinch the Shoots, leaving them Room to grow, and training the Branches regularly to a proper Distance.

Things to be done in the FLOWER GARDEN.

Cover the Beds of Ranunculus's, Hyacinths, Anemonies, and other choice Flowers in Frosty Weather. Such as are not above Ground may be covered with Pease Haulm, or other light Covering. But when the Flowers are come up arch them over with Hoops, and cover them with a Mat or Cloth; they must be uncover'd in warm Weather, and exposed to the Air as much as possible. Hyacinths, Narcissus's, and Iris's, may be cover'd with Tanners' Bark, which prevents the Frost from penetrating into the Earth to destroy the Roots. If the Beds are much above the Paths, lay the Bark, or Litter, or Dung, over the Paths to raise them to a Level, otherwise the Frost will penetrate to the Roots that Way.

Cover the Pots and Tubs of seedling Flowers, such as Narcissus's, Hyacinths, Persian Iris's, Spring Cyclamens, Ranunculus's, Anemonies, Crown-Imperials; and when the Pots and Tubs are not plunged in the Earth, they should be surrounded with Tan, Litter or Dung, to prevent the Frost from penetrating through the Sides.

Turn over your Heaps of Compost that the Frost may mellow them and break the Clods, the oftener the better, and make new Parcels for a constant Supply. If the End of the Month be mild, pick off all the decay'd Leaves from your Auriculas, and take the Earth out from the Top of the Pots, as low as you can without disturbing the Root. Then fill the Pots with rich fresh Earth up to the Hearts of the Plants, without scattering any Earth among the Leaves. These Pots must be placed together, where they will be shelter'd from the Frost, letting them have as much Air as possible in mild Weather, and the Benefit of moderate Showers. They may be placed in a Flower Nursery with an Awning of Hoops over them, which may be covered with Mats in bad Weather. Choice Carnations should be guarded from all hard severe Weather, and protected from Rats, Mice, Rabbits, Hares, and Sparrows.

At the latter End of the Month lay Dung on a Heap for ten or twelve Days, and turn it over two or three Times. This will serve to make Hot-Beds to sow several annual Flowers upon; as Amaranthus's, Tricolors, Globe Amaranthus's, Cockscombs, Diamond Ficoides, and other tender Kinds, that their Flowering may be forwarded.

Plants in FLOWER.

Winter Aconite, Bear's Foot, True Black Hellebore, single Anemonies, blue and white Winter Hyacinths, early Star Hyacinths, Polyanthus's, Primroses, single and double Snow Drops, black Hellebore with green Flowers, round-leaved Spring Cyclamens, Perennial Navelwort with blue Flowers, Heart's Ease, or Pansies, and yellow Alpine Alyson.

Shrubs and Trees now in Flower.

Two or three Sorts of Laurustinus, Glastonbury Thorn, Mezereon, Spurge Laurel, Strawberry Tree, Manna Ash, Cornelian Cherry, Clematis Boetica, Alaternus's, Pyracantha in Fruit, and St. Peter's Wort Shrub in Fruit.

F E B R U A R Y.

Things to be done in the KITCHEN GARDEN.

This is a busy Month if the Weather is mild, most of the principal Crops being now to be sown or planted. You must dig and prepare your Ground for Carrots, Parsneps, Onions, Leeks, Radishes, Spinage, and Cabbage-Lettice, which should now be sown. If they are only for a Family, a few of each Sort should be sown at a Time, which should be repeated three or four Times a Fortnight, or three Weeks after each other; but this is only to be understood of Radishes, Spinage, and Lettices.

Sow your Salading upon moderate Hot-Beds, and on warm Borders, under Walls, Pales, or Hedges, to succeed that in the former Month, for there should be a Supply every eight or ten Days. Sow Scorzonera, Salsafy, Beets, Parsley, Corn Salad, and other hardy Plants; these are best sown on separate Beds, and afterwards thinn'd; but this is not to be understood of the common Parsley, which is frequently sown in Drills. Make moderate Hot-Beds for

for sowing Collyflower Seed for Summer Plants to supply the Kitchen.

Plant Shalots, Rocambole, and Cives; as also Onions to draw up for Scallions in *April*, when the dry Onions will be gone. If the former Month was severe, you must now plant Sugar-Loaf and long-sided Cabbages. Transplant Collyflowers to the Place where they are to grow. Towards the End of the Month slip some old Artichoke Stocks, and plant some of the most promising Plants, and they will produce Fruit in *Autumn*.

Plant Beans, and sow Pease every Fortnight or three Weeks, of the largest Sort, as the Windsor Bean and the Rouncival Pea. Make new Hot-Beds for Asparagus, twice, at about eighteen Days Distance. The Cucumber and Melon Plants raised the last Month, will now be fit to transplant to Beds new made, but not till the violent Heat of the Bed is over, which will be in about a Week. Admit fresh Air to the Plants on the Hot-Beds, as often as the Weather will permit. Sow Seeds of Cucumbers to succeed those that were planted. The Mushroom Beds must now be guarded from great Rain and Snow, which destroy the the Spawn, and therefore one or two must be covered with Frames, or be made under a Shed thatch'd with Straw.

Plant Kidney-Beans on a moderate Hot-Bed for the first Crop, and when the Plants come up give them Air when the Weather will permit. The Dwarf Battersea-Bean is best for this Season, because it is a plentiful Bearer, and will never run to Haulm. Towards the End of the Month in favourable Weather plant Cos, Silesia, and Imperial Lettices, from the Borders where they grew in *Winter*, but some must be left for Cabbaging. You should also sow their Seeds on a Spot of good Ground, in a warm Situation, to come after the Winter Lettices.

At the very latter End of the Month you may sow Cabbages and Savoys, to come early in the *Autumn*. Sow Lettice, Cressies, Mustard, Rape, Radish, Turnips, &c. on hot Beds or warm Borders for Salads; sow a few Celery Seeds on a Bed of rich Earth, in a warm Situation; also sow Asparagus Seed in a Bed of good Earth, for Plants against the next Year.

Transplant Cabbages, Savoys, Parsneps, Leeks, Carrots, and Beets for Seed, as in the former Month, remembering to hang up the Savoys and Cabbages by the Stalks five or

fix Days. At the End of the Month plant Potatoes and Jerusalem Artichokes, if the Weather is pretty good and the Ground dry, otherwise defer it a Month longer; they should be placed in Trenches six Inches below the Surface. Loamy Soil is best for Potatoes, with Dung laid over the Trenches.

Dung and trench the Ground well designed for the planting Asparagus, letting it remain in Ridges till the Season for planting, which is the latter End of the next Month. The Collyflowers which were placed under the Bell in *October* should now be parted, leaving only one of the strongest Plants under each Glas. Hoe the Ground between the Pease and Beans which were sown in Autumn, and draw the Earth to their Stems. This should be done in a dry Day.

At the End of the Month sow Purslane Seeds on a moderate Hot-Bed, which will be fit for Use in *April*. Destroy the Snails in the Holes of the Walls, for next Month they will begin to go abroad.

Things to be done in the FRUIT GARDEN.

Continue to prune your Fruit-Tree against Walls and Espaliers, as also Standard Trees, beginning with the most hardy Sorts first. The Fig-Trees which were covered in frosty Weather, should be opened in warm Weather to give them Air; when the Weather is frosty cover them again. Mend decay'd Espaliers, otherwise it will be too late; transplant all Sorts of Fruit-Trees where they are wanting, this being the properest Season for moist Land; work the Ground well and break the Clods before planting, that the Earth may the better join with the Root; leave the Heads of these Trees on till they begin to push, and then cut them down carefully.

At the End of the Month begin to graft Pears, Plumbs, and Cherries, claying them to keep the Wind out: the Weather must be mild. Likewise sow the Stones and Kernels of hardy Fruits and Stocks, to bud and graft the more generous Kinds upon, taking Care not to leave any above Ground to entice the Mice to destroy the rest. Continue to clear the Trees from Moss, as directed in the last Month. Shoot Bulfinches, for they now do a great deal of Harm to the Fruit-Trees by pecking off the Buds.

The

The Strawberries in Hot-Beds must now have a large Share of Air, and be refresh'd with Water.

Things to be done in the FLOWER GARDEN.

In mild Weather plant the Carnations in Pots where they are to flower, without taking much Earth from the Root; place them in a warm Situation, and arch them over with Hoops, that in bad Weather they may be covered with Mats. You may yet sow Auricula and Polyanthus Seeds in Tubs or Pots of light rich Earth; placing them at first where they may have the Morning Sun till *April*, after which they must be removed to a shady Situation for the Summer Season. The Seeds should be but slightly covered with Earth. Clear the Flower Beds from Weeds, Moss, and Filth; and dig and prepare your Ground in the Flower Nursery, for sowing Seeds, and to receive Plants the next Month.

Transplant Canterbury Bells, French Honyfuckles, Daisies, Rose Campions, Foxgloves, Pinks, Sweet Williams, Perennial Catch-Fly, Double Ragged-Robins, Batchelors Buttons, Gentianellas, Hepaticas, Campanulas, Thrift, Scarlet Lychnis, Columbines, Star Worts, Golden Rods, and other Fibrous-rooted Plants into Borders; though this is better done at *Michaelmas*. In dry frosty Nights cover your Beds of choice Ranunculus's, Anemonies, and Tulips, with Mats to preserve them.

Transplant hardy Flowering Trees and Shrubs, as Lilacs, Roses, Honyfuckles, Jasmines, &c. Most Sorts of Forest Trees may now be transplanted with Safety; but Evergreens should not be removed till the Middle of *April*. Plant Dutch Box, for edging of Borders; but it is a better Season in *September*, especially for dry Ground. Break up and turn your Gravel Walks, but don't rake them till towards the End of the next Month, by which Time they will be settled.

Make Hot-Beds for your tender annual Flowers, which should be brought forward early in the Spring, as Amaryllis's, Double-flowering Stramonium, Double-striped Balsamine, with several others. You must also plant Tuberose in an hot Bed. Sow the double Lark-Spur on warm dry Borders. The Seeds of China Star-wort must now be sown on warm Borders of light Earth.

Plants in FLOWER.

Winter Aconite, Bear's Foot, True Black Hellebore, Green-flower'd Black Hellebore, Snow Drops, several Sorts of Spring Crocus's, early white and blue Hyacinths, Starry Hyacinths, Persian Iris, Hepaticas, single Wall Flower, early Tulips, Polyanthus's, Fennel-leaved Perennial Adonis, Narcissus, Pansies or Heart's Ease, Periwinkles, Yellow Alpine Alysson, East Allyson with Purple Flowers and Violets.

Trees and Shrubs now in Flower.

Two or three Sorts of Lauristinus, Red and White Mezereon, Spurge Laurel, Spanish Traveller's Joy, Cherry Plum, White-flower'd Almond, Cornelian Cherry, Filberts, Hazle Nuts, and Glastonbury Thorn.

M A R C H.

Things to be done in the KITCHEN GARDEN.

The frequent Changes of Weather in this Month make a diligent Attendance on the Hot-Beds of Cucumbers and Melons necessary. You should now add a new Lining of fresh Horse Dung round the Sides, and cover the Glasses with Mats every Night. But in the Day-Time they must have fresh Air, whenever the Weather will permit. Sow Cabbages, Red Cabbages, and Savoys for Winter Use, and plant out all your Collyflower Plants which are remaining into Winter Beds. The Collyflower Plants which were raised the last Months, should now be pricked out on fresh Hot-Beds to bring them forward. Continue to put Peas and Beans in every Fortnight, and sow Radishes, Spinage, and fresh Salad Herbs, as also Celery Seed at the End of the Month.

Sow Parsneps, Carrots, Onions, Leeks, Beets, Borage, Bugloss, Burnet, Dill, Fennel, Chervil, and Alifanders, early in the Month, in a dry Soil. Also earth up Alifanders to blanch them. You may yet sow Parsley, Sorrel, Orchis, Spinage, and Marigolds, if the Ground be moist. Slip and plant Mint, Tarragon, Pennyroyal, Camomile, Baum, Savoury, Sage, Rosemary, Hyssop, Lavender Cotton, Spike Lavender, Wormwood, Southernwood, and other Aromatic Plants. Slip the Off-sets of the old Roots

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of Skirrets, and plant them in Rows ten Inches asunder, watering them in dry Weather.

Remove your large Kind of Lettice Plants from warm Borders to a more open Place. Sow the Seeds of Cos, Silesia, Imperial and other Lettices, in an open rich Spot of Ground, as also Endive to come early in the Summer. Towards the End of the Month fork the Asparagus Beds, without hurting the Crown of the Roots. Towards the Middle of the Month sow large rooted *Dutch Parsley*, in Drills, about a Foot asunder; and when they are thinned leave them three or four Inches apart in the Rows. At the End of the Month plant new Asparagus Beds, if the Ground be dry.

Young Radishes and Spinage sowed in *January* should now be howed, leaving them four or five Inches asunder, stirring the Ground between them. Continue to make Beds of Cucumbers, Melons, and Purslane. Towards the End of the Month sow Cucumber and Melon Seed, to ridge out under Bell or Hand-Glasses Dress your Artichokes, and leave two or three of the cleanest Plants upon each Root to bear, slipping the rest clear off; the best of which may make a new Plantation.

Sow Chardons upon a Bed of rich light Earth, pretty thin; and water them in dry Weather till they are big enough to transplant. At the End of the Month put Kidney-Beans in warm Borders, in dry Weather. Sow Sweet-Marjoram, Thyme, Hyssop, and other tender Aromatic Plants, on a dry Soil. Continue to sow your Salad Herbs on warm Borders till the Beginning of the next Month, and then an open Place will be better. At the End of this Month, or Beginning of the next, sow Purslane on warm Borders. Sow Turneps on an open Spot of Ground to come in *May*.

At the End of the Month sow Hemp, Flax, Clover, Saintfoin, and Lucern, in a favourable Season; as also Barley and *March Rye*. In dry Weather roll Wheat. Sow Rouncival and Gray Peas in open Fields. Hoe the Ground between Peas that are come up in dry Weather.

Work to be done in the FRUIT GARDEN.

You must now complete the Pruning of Peaches, Apricots, and Nectarines, otherwise the Buds may be rubbed off in nailing the Branches. This done, dig the Ground about

about the Roots to destroy the Weeds; if the Nights are frosty, cover them with Mats, Canvas, or Weeds. In a dry Season sprinkle some Water over the Branches of the Fruit-Trees: you may yet transplant Fruit-Trees to a moist Soil. This is the chief Season for grafting Fruit-Trees, beginning with the early Kinds, and ending with Apples. Cut off the Heads of those Stocks that were inoculated last Summer, leaving about four Inches above the Bud. This done, the Ground between the Trees should be dug to bury the Weeds.

Dress and lay fresh Earth on your Strawberry-Beds, pulling off their Strings, and clearing them from Weeds. Dig between the Rows of the Raspberries to make the Ground clean, and loosen the Earth. Fruit-Trees planted last Autumn should now be headed down to three or four Eyes. Cover the Ground carefully with green Sward, turning the Grass downward, which will prevent the Sun and Wind from penetrating to the Roots. Dig and clear the Ground between your Gooseberries and Currants to strengthen their Blossoms.

Work to be done in the FLOWER GARDEN.

Transplant Carnations, Pinks, Sweet-Williams, Rose-campions, Thrifts, Asters, Golden Rods, Perennial Sun-Flowers, *Canterbury Bells*, Peach-leav'd Bell-Flowers, *French Honeysuckles*, Daisies, Bupthalmums, Columbines, Leucanthemums, Hieraciums, Hepaticas, Fraxinellas, Ragged Robin, and wholesome Wolf-bane. Stir the Earth of your Borders and Beds of Flowers, which were planted at *Michaelmas*, with a narrow Trowel. This will prevent the Growth of Weeds. When your choice Hyacinths, Anemonies, and Tulips, begin to shew their Flower-buds, cover them with Mats or Canvas in bad Weather. Put small Sticks down by the Roots of the Hyacinths to support the Stems by fastening them thereto.

Plant double Anemonies, and in dry Seasons refresh them with Water. Place the Boxes and Pots of seedling Auriculas in a shady Situation, and refresh them gently with Water in dry Weather. Take Care to protect your Pots of choice Auriculas from frosty Nights and blighting Winds, refreshing them with Water in dry Weather; but the Water must not get into the Centre of the Plants.

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Give fresh Earth to the Carnations that were planted for good at *Michaelmas*, picking off their decayed Leaves. Pick the dead Leaves from the Pots of double Rose-campions, Campanulas, scarlet Lichnis, &c. and after having taken out the Earth from the Tops refill them with fresh rich Earth.

Clear the Flower-beds and Borders of Weeds, and gently stir the Surface of the Ground to take off the Moss: At the End of the Month you may sow the Seeds of all hardy annual Flowers, such as Flos Adonis, *Venus's* Looking-Glass, *Venus's* Navelwort, sweet-scented Peas, dwarf double Poppy, dwarf annual Stock, Nasturtium Indicum, &c. These are to be sown thin, and to remain in the same Place.

You may sow the Seeds of many Kinds of biennial and perennial Plants in your Flower Nursery, to supply the Borders of the Flower Garden the following Year; such as Columbines, *Canterbury* Bells, *French* Honeyfuckles, Stock Gilliflowers, Wall-Flowers, Sweet-Williams, Pinks, Tree-Primroses, Polyanthus's, single Rose-campion, single Catch-Fly, and Veronicas. Upon moderate hot Beds you may sow Seeds of Marvel of *Peru*, *French* Marygold, Female Balfamine, *African* Marygold, *Indian* Pink, sweet Sultan, Love Apple-tree, Amaranthus, Love lies a bleeding, and other Sorts.

Make fresh moderate hot Beds for your choice annual Plants which were sown last Month, and plant them at proper Distances, refreshing them with Water when they want it.

At the latter End of the Month, if the Season is mild and inclinable to be wet, transplant most Sorts of Evergreens, covering the Surface of the Ground with Mulletts to save the Roots. Sow the Seeds of Firs, Pines, Bays, Cedars, and other evergreen hardy exotic Trees, in Places exposed only to the Morning Sun. If the Place is wet raise it above the Level of the Ground.

Plants in Flower.

Crocus's of various Sorts, double Snow-Drops, several Sorts of Narcissus's, Persian Iris, double Pilewort, Daffodils, Spring Cyclamens, early Tulips, Crown Imperials, Hyacinths of several Sorts, Fennel-leav'd Perennial Adonis, some

some Anemonies, Wall-Flowers, Violets, Perennial Furni-
tary, Primroses, Polyanthus's, Daisies, Hollow Root, Her-
modactyls, Spring Colchicum, Auriculas's, Heart's Ease or
Pansies, Rose Root and Wood Anemonies.

Trees and Shrubs in FLOWERS.

Almond Trees, Cherry, Plumb, Mezereons, Spurge
Laurel, Laurustinus, Spanish Traveller's Joy, Cornelian
Cherry, Benjamin Tree, Willow-leav'd Sea Buckthorn,
upright Honeyfuckle, scarlet flowering Maple, Norway
Maple, Laurel or Cherry Bay, Larch Tree and Manna
Ash.

A P R I L.

Work to be done in the KITCHEN GARDEN.

Make Ridges for Melons and Cucumbers, to be cover'd
with a Bell or Glasses. You may still sow Sweet-Marjo-
ram, Thyme, Summer Savoury, and other aromatic Plants.
Sow Purslane in warm Borders, and plant Kidney-Beans
in dry Weather. Hoe your Crops of Radishes, Carrots,
Parsneps, thinning them out to proper Distances in dry
Weather, that the Weeds may be destroyed.

In moist Weather plant Slips or Cuttings of Sage, Rue,
Rosemary, Savoury, Mastich, Lavendar Stæchas, Laven-
der Cotton, and other aromatic Plants. Plant Garden
Beans for a later Crop. Sow the Marrowfat, and other
Kinds of Pease. Slip and plant Artichokes on a moist
Soil. Plant out the Colliflower Plants that were raised in
February. Sow all your Salad Herbs every Week; as also
Cos, *Silesia* and other large Lettices. Transplant Celery
Plants to Beds of rich Earth, about three Inches Distance,
watering them duly till they have taken Root. Hoe the
Ground between the Rows of Beans and Peas, and draw
up the Earth to their Stems. Draw the Earth up to the
Stems of Cabbages and Collyflowers after a Shower of
Rain, to guard them from the Sun and Wind. Destroy
the Snails and Slugs that come abroad after a Shower.
Sow Turneps on a moist Spot of Ground; those sowed
last Month should be hoed out to a proper Distance. Weed
the Beds of Mint, Taragon, Parsley, &c. if the Season is
dry water them. Plant Cuttings of Mint, Taragon, &c.
to make new Beds.

Transplant the large Lettices which were sown the
former Month, watering them till they have taken Root.

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Thin the Cabbages and Savoy's that were sown the last Month, and prick them out into Beds. Sow Hemp and Flax, as also large Gray Peas and Rouncivals in the open Fields. Draw out all the young Plants from the Artichokes that have grown since they were slipped. Sow more Celery to succeed that in the former Month.

Work to be done in the FRUIT GARDEN.

Look carefully to your young Fruit-Trees, observing to water them in dry Weather; if their Leaves begin to curl water them all over, but not in the Heat of the Day. When the Fruit-Trees are infested with Insects, wash them with a Decoction of Tobacco Stalks. Those Fruit-Trees which were inoculated last Summer, should have the Stocks cut down to three or four Inches above the Bud. At the End of the Month look over the Walls and Espaliers of Fruit-Trees, training in the regular kindly Shoot, and displacing all foreright luxuriant ones. Thin your Apricots if too thick. Plant Cuttings of Vines in Places where they are to remain, always keeping a Knot of the old Wood at the Bottom of each, and bury them in the Ground that the uppermost Eye may be even with the Surface of the Ground.

Look at the Vines against the Walls, rubbing off all small dangling Shoots, and break off the weakest when there are two together. Weed the Beds of Strawberries, and in a dry Season water them. Keep the Borders near the Fruit-Trees from the Weeds, as well as large growing Plants. When the Ground binds hard, loosen it with a Dung Fork. Uncover the Fig-Trees in the Middle of the Month, by Degrees. Fruits in the forcing Frame must now have much fresh Air, in Proportion to the Heat of the Weather, and the Branches should be frequently sprinkled with Water.

Work to be done in the FLOWER GARDEN.

Gravel Walks before turned up should now be raked level, and rolled. Grass Walks must be mowed. The Borders of the Flower Garden must be cleaned from Weeds, and the tall growing Plants tied to Sticks.

You may now sow annual Flowers on your Borders, such as Candy-Tuft, Venus's Looking-Glass, Lupines of several

several Sorts, sweet Peas, Tangier Peas, Dwarf Lychnis, Lobels, Catch Fly, Venus's Navelwort, Nasturtium Indicum, Oriental Mallow, Bastard Saffron, Hieraciums of several Sorts, Jacea's, Lotus's of divers Kinds, Astragulus's, with several other Kinds of hardy Annuals which need no transplanting; they should be sown in Patches, and thin'd, leaving but a few Plants to flower.

In your Flower Nursery sow Canterbury Bells, Columbines, Sweet-Williams, Pinks, Carnations, Hollihocks, French Honeyuckles, Stock Gilliflowers, Wall Flowers and many other Sorts.

Make fresh Hot Beds for planting tender Annuals, as Amaranthus's double striped Balsamines, &c. which must be brought forward this Season. Put some more Roots of Tuberoses into a moderate hot bed, to succeed those planted in the former Month. The Seeds of choice Carnations and Pinks must now be sown in Tubs, Pots, or Borders, but don't bury them too deep, nor forget to water them in dry Weather. Screen your Tubs of seedling Auriculas from the Sun, and frequently refresh them with Water. Set Sticks up to your Carnations, and carefully fasten their Spindles thereto. Your Pots of Auriculas should be now removed under a Covert, to preserve them from the Wet, the Heat of the Sun would be prejudicial; they are usually placed on Shelves one above another, for the Conveniency of taking them down to shew them; those from which you would save Seeds should be removed into the Air as soon as fully blown, where may they have the Morning Sun.

The Beds of fine Ranunculus's, Anemonies, Tulips, and Hyacinths now in Flower, should be cover'd with Mats or Cloths to defend them from Wet and the Heat of the Sun; but they must be opened every Morning and Evening. At the latter End of the Month you must take up the Roots of Saffron, Colchicums, yellow Autumnal Narcissus, and other bulbous-rooted Flowers that blow at *Michaelmas*, and whose Leaves are now decay'd, which must be put into the Ground again in *July*.

You may now transplant all Sorts of Evergreens with safety when it is like to rain, now cutting them to whatever Shape you please.

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Plants in FLOWER.

Anemonies, Ranunculus's, Polyanthus's, Auricula's, Tulips, Crown Imperials, Hyacinths, Narcissus's, Daffodils, Jonquils, Violets, dwarf Flag Iris, great Snow Drops, Spring Cyclamens, Spring Colchiums, bulbous Fumitory, Rose Root, Duck's Foot, Wood Anemomy, Friar's Cowl, double Lady Smock, double Pileworth, double Daifies, Columbines, large green flower'd Ornithogalum, Persian Lily, double Saxifrage, Venetian Vetch, Lychnis's, Cat's Foot, Lily of the Valley, Dame's Violet, Leopard's Bane, Honywort, Heart's Ease, Periwinkles, and some others.

Trees and Shrubs in FLOWER.

Lilac with white Purple and blue Flowers, Persian Lilacs; double flowering Peach Tree, double flowering Pear Tree, Cherry Plum, Almonds with Peach-colour'd Blossoms, Bird Cherry, Cornish Cherry, double flowering Cherry, Cockspur Cherry, dwarf Almonds, Bay Tree, Benjamin Tree, Barberry Tree, Bilburry Bush, Bladder Nut Privet, Service Tree, Turpentine Tree, early white Honeyfuckles, yellow Jesmine, and some others.

M A Y.

Work to be done in the KITCHEN GARDEN.

A dry May will hurt the Blossoms, but fine Weather will stock the Markets. Clear all Sorts of Crops from Weeds as soon as possible, and destroy the Weeds on the Dunghills. Sow Purslain and Salad Herbs every three or four Days. Put in Pease and Beans for latter Crops in a moist Soil, and Kidney-beans for a second Crop; and in moist Weather Cabbages and Savoys for Winter Use. Clear the Weeds from the Colliflower and Cabbage Plants, and in moist Weather draw Earth upon their Stems. Transplant Radishes for Seed in Rows at three Feet Distance and two Feet asunder. Cucumbers and Melons under Frames must be carefully shaded with Mats in the Heat of the Day.

Early Collyflowers will now begin to appear in the Centre of the Plant, therefore they should be carefully looked after every Day, breaking down some of the inner

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Leaves

Leaves to preserve them white. Hoe Winter Crops of Onions, Carrots, Leeks to clear them from Weeds, transplant Silesia, Cos, Imperial and *Dutch* brown Lettuces, into North Borders and sow more to supply the Tables in *July* and *August* in an open Situation; if they are sow'd thin and hold they will be better than when transplanted.

Early Cabbages now begin to turn their Leaves for cab-baging, which may be forwarded by tying the Leaves together with a Withy. Pull up the Plants from the Root of Artichokes which have been produced since the Stocks were slipt, and take away small Artichokes from the Sides of the Stems. These are called Suckers. Sow Skirrets, Salsify and Scorzonera for a full Crop. When it is like to rain sow Turneps, and hoe those that were sown last Month, leaving them about nine Inches asunder. At the End of the Month sow Broccoli for Spring Use, and plant a latter Crop of Kidney Beans.

Sow Cucumbers in the open Ground at the End of the Month to produce Fruit for Pickling. Drive Stakes into the Ground at eight Foot Distance, and fasten Lines from Stake to Stake to support the Stems of the Onions now in Flower. The same Care should be taken of your Savoy, Cabbages, Carrots, Parsnips, Broccoli and Leeks which were planted for Seed, for being now in Flower, their Heads will be too heavy to be supported by their Stems.

Work to be done in the FRUIT GARDEN.

Look over the Espalier Hedges, and displace the fore-right and luxuriant Shoots, and train the kindly Branches that you would preserve. Thin Apricots and Peaches if you find them too thick, never leaving two together; middling or small-Peaches, and Nectarines, should be six Inches asunder, and eight if large. Look carefully over the Vines, and stop such Shoots as have Fruit on them at the second and third Joint beyond the Fruit, and train the Branches close to the Wall in a regular Order. Shoots that are designed for bearing another Year should not be stopt till the End of next Month. Rub off all weak and trailing Branches close to the Places where they are produced. This done there will be no Necessity of divesting the Shoots of their Leaves, as unskilful Persons often do. After warm Showers look after the Snails in the Mornings and Evenings, for now they may be easily taken.

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If the Season is dry refresh the Trees lately planted with Water, sprinkling it all over them. Keep the Borders of the Fruit-trees free from Weeds, and at the End of the Month break off the Clay from the Trees grafted in Spring, and loosen their Bandage.

Work to be done in the FLOWER GARDEN.

Take up choice Hyacinth roots which are past flowering, and lay them horizontally in a Bed of Earth to ripen, leaving out their Leaves and Stems to decay. Shade your choice Tulips, Ranunculus's, and other curious Flowers now blowing, from the Sun during the Heat of the Day. Take up Roots of Saffron and lay them on Mats in the Shade to dry, then put them in Bags till July. After the Middle of the Month plant out your hardy Annuals, such as Sweet sultan, *French* Marygolds, &c. Sow dwarf annual Flower Seeds in Patches, upon Borders, such as Candy-tuft, *Venus* Looking-glass, *Venus* Navelwort, dwarf annual Stock, &c. And then the Borders will keep their Beauty all the Season. Also plant several Kinds of Lupines, sweet scented Pease, Seeds of *Indian* Nasturtium, large Convolvulus, and other climbing Plants, where they may have some Support.

Transplant biennial and perennial Flowers that were sown in *March* and *April* into Beds of fresh Earth where they may remain till the Beginning of *September*, such as *French* Honey-suckles, *Canterbury* Bells, Sweet-williams, Pinks, Columbines, &c. Fill up the Carnations divesting them of the side Pods. Auriculas past flowering should be removed to a shady Situation. Transplant Stock-gilliflowers, Wall-flowers, seedling Pinks, Carnations, &c. and sow Seeds of annual scarlet and purple Stock-gilliflowers, and at the End of the Month take up early Tulip-roots and forward Anemonies, if their Leaves are decayed; as also *Bella-donna* and *Guernsey* Lilies: In moist Weather remove the young Plants of *Venice* Mallow, Oriental Mallow, Scabious, Sweet Sultan, *Indian* Pink and *China* Starwort into the Borders. Place your Pots of choice Carnations on the Stage.

Plants in FLOWER.

Tulips, Anemonies, Ranunculus's, Pinks, Asphodel,
H h 2 Lily

Lily of the Valley, Thrift, Daisies, Valerian, Sage Rosemary, Moth Mulein, *London* Pride, *Turkey* Perennial Poppy, Pæonies, Columbines, Stock-gilliflowers, Wall-flowers, *Solomon's* Seal, yellow Asphodel Lily, Dragon, Bistort, Ladies Mantle, Bird's Eye, yellow Violet, double white Narcissus, double Rockets, Corn Flags, Hare Bells, starry Hyacinth, blue Grape Hyacinth, *Savoy* Spiderwort, Periwinkles, Bell-flowers, Birthwort, Asarabacca, Catsfoot, great Gentian, Honeyworth, Mandrake, great Navelwort, spotted Lungwort, Batchelors Buttons, double white Mountain Ranunculus, double ragged Robin, double Feverfew, Fox Gloves, Seawort, Sea-Holly, double Saxifrage, double Ladies Smock, Borage-leaved Auriculas, *Spanish* Toad Flax, Spurges, Grass-leaved Ranunculus's, Satten Flower, upright Speedwell, yellow Eastern Bugloss, Garden Bugloss, Scabious and others of less Note.

Trees and Shrubs in FLOWER.

Jerusalem Sage, Yellow Jessamin, Lilacs, Honeyuckles, Gelder Rose, White Thorn, Flowering Ash, Bladder Nut, Cinnamon Rose, Monthly Rose, Damask Rose, Burnet Leaf Rose, Scotch Rose, Apple-bearing Rose, Horse Chesnut, Bladder Senna, Double Flowering Almond, Cockspur, Hawthorn, Double Flowering Hawthorn, Cinquefoil Shrub, Bird Cherry, Cornish Cherry, Laurocerasus, Scarlet Horse Chesnut, Perfumed Cherry, Mallow Tree, Sea Buckthorn, Dwarf Medlar, Candle Berry Myrtle, Christ's Thorn, Pistachia Nut, Sumach, Service, or Quickbeam, Double Flowering Cherry, and some others.

J U N E.

Work to be done in the KITCHEN GARDEN.

Transplant Savoy and Cabbage Plants for the Kitchen in the Winter; hoe and clean Carrots, Parsneps, Turneps, Onions, Leeks, Beets, and all other late Crops. Plant out your Plants of all Sorts of Sweet Herbs, as Thyme, Hyssop, Sweet Marjoram; as also Clarey, Burnet, Sorrel, Marigolds, and many other Sorts, allowing them Room enough to spread. Fill up the Alleys between your last Ridges of Melons with Loam and rotten Cow Dung mix'd. Sow Turnips on a moist Spot of Ground, when it is like to rain. Sow Brocoli Seed for the second Crop, and Fennochia; transplant Celery into shallow Trenches for blanch-

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blanching, placing the Plants four or five Inches distant, and make the Trenches three Feet asunder. Plant Kidney Beans, and sow brown Dutch, and common Cabbage Lettices for a late Crop. Transplant Lettices that were sown in *May*, to a shady Situation.

Transplant Endive into a moist Spot of Ground for blanching, allowing them a Foot distance each Way. Sow Endive Seed for a latter Crop. Continue to sow Cresses, Mustard, Turnip, Rape, Raddish, &c. for small salad Herbs, every three or four Days. The Broccoli sown in *May* should be prick'd out into Beds three Inches asunder. Weed and thin the Plants in the Cucumber Holes for Pickling, leaving four of the strongest in each Hole, and the Earth up to the Shanks.

In dry Weather gather Seeds of all Sorts that are ripe, spreading them upon Mats or Cloths to dry, before they are rubbed or beaten out of the Husks or Pods. Gather Herbs for drying now in Flower, hanging them up in a dry shady Place to dry at leisure. Melons, which are now setting, should be shaded in the Heat of the Day with Mats. Gather Snails in the Mornings and Evenings after a Shower of Rain; remember to destroy the Weeds that come up, and transplant Leeks from the Seed of Beds to the Places where they are to remain. Keep the Asparagus Beds planted in *March* very free from Weeds, and transplant some of the Endive which was sown in the former Month.

Work to be done in the FRUIT GARDEN.

Inoculate Stone Fruit after the Middle of the Month in the Evening or in cloudy Weather, begin with the Masculine Apricot, and proceed to the rest according to the Time of their ripening. In dry Weather water such Trees as were transplanted in the former Season, mulching the Surface of the Ground above the Roots; and fasten Shoots to the Wall or Espalier. The loose Branches of the Vines must be also fastened to the Walls, and Side Shoots or weak trailing Branches displaced, that the Fruit may enjoy the Benefit of the Sun and Air.

Work to be done in the FLOWER GARDEN.

Transplant annual Flowers out of the Hot-Bed into the

the Borders, observing to do it on a cloudy Day, or in the Evening, and water them to settle the Earth to their Roots. Lay down Carnations, Pinks, double Sweet-Williams, and such other fibrous-rooted Plants, that are propagated by Layers, watering them as soon as it is done. This is a proper Season for taking up and transplanting the Roots of Cyclamens, Saffron, Persian Iris, Snow Drops, Winter Aconite, Spring Crocus's, and other bulbous-rooted Flowers whose Leaves are decayed. Cut off the Stalks of Flowers as are decaying, and tie up such Flowers as are yet to blow, especially tall autumnal Plants.

Take up Hyacinth Roots out of the Beds where they were laid the former Month to ripen, and clear them from Filth, laying them on a Mat to dry, in a Shady Place; afterwards put them into Drawers or Boxes where they may enjoy the free Air.

Take up the Roots of Tulips, Anemonies, and Ranunculus's whose Leaves are decay'd, and dry them and put them up as before, out of the Reach of Rats or Mice. The Pods of Carnations should be opened in two or three different Parts to make Room for the Flowers to expand equally on every Side.

Plants in FLOWER.

Larkspurs, white Lily, Orange Lily, red Day Lily, Everlasting Pea, Sweet Scented Pea, Tangier Pea, horned Poppies of several Sorts, Veronica, Rose Campion, double and single Virgin's Bower, Hyssop, Clary, Oriental Bugles, Sweet Sultan, Jaceas, Snap Dragons, Tree Primrose, Willow Weed, Loosestrife, Hieraciums, Chrysanthemums, Peach Leav'd Bell Flower, white Wall Flower, double and single Bloody Cranes Bill, red, white, and Garden Valerian, Oriental Ox-eye with yellow and white Flowers, red and white Batchelors Buttons, with double and single Flowers, double ragged Robin, Tradescants, Spider Wort, Poppies of various Kinds, Columbines of various Colours, Spanish Figwort, dwarf annual Stock, Fox Gloves, Corn Flags of two or three Sorts, white Hellebore, Africans, Female Balsamine, Sea Ragwort, Sea Lavenders, Smilax, Asphodels, Cyanus's of several Sorts, Birthwort, St. Peter's Wort, double Camomile, Capsicum, greater Centaury, Dittany of Crete, Dragon, Giant Fennel, Sun

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The GARDENER'S CALENDAR. 355

Sunflower, Poley Mountain, Lupines, Water Lily, Helianthemums, and others of less Note.

Trees and Shrubs in FLOWER.

Pomgranate with double and single Flowers, Spanish broad-leav'd yellow Jessamine, white Jessamine, Roses of various Sorts, black Citifus, Nettle Tree, Shrub Cinque-Foil, Tree Germander, evergreen and long blowing Honeyfuckles, Shrubby St. John's Wort, Carolina Kidney-Bean Tree, Base Horehound, Mallow Tree, Persimon, Capcr Bush, Tulip Tree, scarlet flowering Horse-Chesnut, Perennial shrubby Lamium, and others of lesser Note.

J U L Y.

Work to be done in the KITCHEN GARDEN.

Now sow the last Crop of Kidney Beans; the best Sort is the large white Dutch, which will continue bearing till the Frost destroys them. At the End of the Month sow Spinage for the Winter Use: as also Coleworts, Carrots and Onions to stand the Winter for Spring Use; likewise Turnips in the open Fields against the Spring. Plant Celery in Drills for blanching; as also Endive for blanching. Sow all Sorts of Salad Herbs, Water Plants, lately transplanted, in the Evening; clear the Garden and Dungle-hill of Weeds; gather the Seeds of Spinage, Corn Salad, Welch Onions, Cressles, and others that are ripe. Pull up Onions, Garlick, Rocambole, Shalots, &c. when their Leaves begin to wither, and dry them well before they are laid up for Winter Use. Earth up Celery planted in the Drill last Month as it advances in Height. Tie up the Endive which is full grown, to blanch it. Pull up the Stalks of Beans, Cabbages, and the Haulms of Pease which have done bearing. Melons should be water'd but little if you would have them well tasted. Repair the young Asparagus Beds that were planted the last Spring, by planting fresh Plants where any have failed. The Cucumbers under Hand Glasses must be duly water'd. Transplant the Celery which was sown in May into Beds, and transplant some Endive. Sow Turnip rooted Radish, and it will be fit for Use in October. Sow Brocoli, and it will be fit for Use in April. About the Middle of the

the Month, sow Endive for the last Crop, and small Salad Herbs in North Borders, repeating it every three or four Days. Transplant out the Cos, Silesia, and other Sorts of Lettice, which were sown last Month, and they will be fit for Use in September.

Work to be done in the FRUIT GARDEN.

Look over the Wall and Espalier Trees, and manage them as before directed. Bud all Sorts of Fruits not yet done; hoe and clean the Nurseries from Weeds; gather Snails in the Morning and Evening after Rain; place Glafs Phials fill'd with Honey-Water on several Parts of the Walls to destroy the Wasps and Pismires, by which Means they will be drowned; and displace the dangling Shoots of the Vines.

Work to be done in the FLOWER GARDEN.

Take up the Bulbs of such late Flowers, as were not fit the last Month; and transplant those that will not bear to remain long above Ground. Continue to make Layers of Pinks, Carnations, Sweet-Williams, if not done the former Month. Transplant Pinks, Carnations, Stock Gillyflowers, Wall Flowers, Hollyhocks, French Honey-suckles, Canterbury Bells, Scabious's, Pyramidal Bell Flowers, Rose Campions, Fox Gloves, Tree Primroses, and some others that were sown late in the Spring. They should be placed in Nursery Beds, where they may have Room to grow to *Michaelmas*, when they must be removed into Borders. Gather the Seeds of Flowers that ripen, and preserve them in their Husks or Pods, till the Season of sowing them.

Cut off the Stalks of Flowers that begin to wither and decay, and tie up all tall growing Plants that are yet to flower. Inoculate Jasmines, Roses, and other Sorts of curious flowering Shrubs and Trees. Cut and trim Hedges, clip Box-Edgings, mow Grass Plots, and keep the Walks rolled. Manage Carnations as before directed. At the End of the Month you may take up the Layers of Pinks, Carnations, Sweet-Williams, &c. which have taken Root, and plant them in Pots or Borders. Sow

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annual Seed Flowers in warm Borders to stand the Winter; such as the great blue and flesh-coloured Lupines, sweet scented Pea, sweet Sultan, double Larkspur, Venus Navelwort, and some others. The seedling Auriculas which came up the last Spring, must now be planted in Tubs or Pots filled with rich Earth, and placed in a shady Situation. You may bring the most tender annual Plants out of the hot Beds, such as Amaranthus's, double Balsamines, and some others.

Plants in FLOWER.

Carnations, Pinks, Sweet-Williams, double and single ragged Robin, dwarf annual Stock, French Willow, single and double Virgin's Bower, Linaria's of several Sorts, Jacea's of several Sorts, Everlasting Pea, sweet scented Pea, Tangier Pea, white Lily, Day Lily, white Hellebore with green Flowers, Indian Scabious, Sea Holly, sweet Sultan, Poppies of divers Kind, Peach-leav'd Campanula, Venus Looking-Glass, Venus Navelwort, double Ptarmica, double Feverfew, double Camomile, annual Stock Gillyflowers, double Rose Camplons, Larkspurs, Lupines of several Sorts, Amaranthus's, Capsicum Indicum, red Garden Valerian, Hollyhocks, Sunflowers of several Sorts, Golden Rod of several Kinds, French Marygold, Female Balfamine, some Sorts of Starwort, dwarf Lychnis, Mal lows, Indian Nasturtium, Globe Thistles, Limonium, greater Centaury, Anonis of three or four Kinds, Astragalus's, scarlet and blue Cardinal Flowers, Poley Mountain, Tobacco, Tree Primrose, Clove Gillyflowers, double and single Soapwort, and some others.

Trees and Shrubs in FLOWER.

Several Sorts of Roses, Spanish Broom, white Jasmine, dwarf yellow Jasmine, double and single Pomegranate, Virginian Trumpet Flower, Agnus-Castus, Male Cistus of several Kinds, Shrub Cinquefoil, Passion Flower, Catesby's Climber, Dutch Honeysuckle, several Sorts of Honeysuckle, Tulip Tree, with some others.

AUGUST.

Work to be done in the KITCHEN GARDEN.

Sow Onions for early Salads in the Spring, and Spinnage to stand all Winter, the prickly seeded Kind is the best

best for this Purpose. Sow early Battersea Cabbage Seed, about the Beginning, and soon after Colliflower Seed for an early Crop, to be planted under Bell or Hand Glasses, and some Days after more Seed for a second Crop. After the Middle of the Month, sow common Cabbage Lettice, and brown Dutch Lettice to stand the Winter on warm Borders without any Covering. At the End of the Month sow Cos and Silesia Lettice in the same Manner.

In moist Weather transplant Endive and Celery, and water them well to settle the Roots. Transplant Lettices which were sown in the former Month in a warm Situation, to supply the Kitchen in Autumn. At the End of the Month sow Chervil, Angelica, Lovage, Masterwort, Scurvy Grass, Alexanders, sweet Sefeli and Corn Salad. Cut off the flowering Branches of Lavender, Rosemary, Savoury and Hyssop, that they may make new Shoots before Winter, in moist Weather. Pull up Onions, Garlick, Rocambole and Shalots when their Leaves begin to wither, and lay them in an airy Place to dry.

Earth up Celery; and take away Suckers from the Sides of the Stalks of Artichokes. Transplant Broccoli where it is to remain for flowering. Transplant Savoys to come late in the Spring. Keep the Roots of Melons from Wet, or it will decay the Fruit. Cucumbers for Pickling are now to be gathered as soon as fit, two or three Times a Week; water them frequently in dry Weather. Always keep every Thing free from Weeds, and plant Slips of Sage, Rosemary, Stæchas, Lavender, Mastich, and other aromatic Plants.

Sow the Seeds of Cresses, Rape, Mustard, Turnips, Radishes, and other Kinds of Salad Herbs every Week. Gather all Sorts of Kitchen Garden Seeds, and spread them on Mats to dry, rubbing them out of their Husks or Pods. Sow Turnips for a later Crop, and earth up Finnochia, which is full blown, to blanch it.

Work to be done in the FRUIT GARDEN.

Destroy Snails, Tom Tits and Sparrows, that will spoil the Fruit, and fix Phials of Honey-Water in the Trees to catch Wasps. Fasten Branches that are displaced to the Walls; displace the trailing Branches of Vines for the last Time. Untie the Buds of Fruit-Trees that were in-

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culated the last Month, and clear the lower Parts of the Stocks from Shoots, keeping the Ground clear from Weeds.

Work to be done in the FLOWER GARDEN.

Transplant the Layers of Carnations, Pinks and Sweet-Williams, which by this Time have taken Root. Choice Carnations designed for Pots may be planted at this Time, each in a small Halfpenny Pot filled with light fresh Earth, and placed in a shady Situation till they have taken Root; after which they should be placed in an open Situation till the Beginning of *October*, and then under a Hot-Bed Frame, or in an old Bark Bed arched over with Hoops, to protect them from the hard Weather.

But those Carnations, Pinks, and Sweet-Williams, that are designed for Borders, should now be planted in Beds in the Flower Nursery, to remain till the latter End of the next Month, when you must dig the Borders, and new plant them: They must be taken up with a Ball of Earth at their Roots, and planted in the Borders with other Flowers.

Shift choice Auricula's into fresh rich Earth, in a shady Situation, till they have taken Root.

Gather all Sorts of Flower Seeds as they ripen, and dry them in the Sun; then preserve them in the Pods or Husks till the Season of sowing them. Transplant Polyanthus's Primroses and seedling Auriculas's, shading and watering them till they have taken Root; as also closing the Earth to the Roots to keep away the Worms. Cut down decay'd Stalks of Plants that have done flowering; and your Pots of annual Plants must be duly water'd in dry Weather. At the End of the Month prepare Beds to receive choice Hyacinths, Tulips, and Ranunculus's, that the Earth may settle before the Roots are planted; make the Beds three Feet deep, and lay rotton Cow-Dung at the Bottom.

Sow Seeds of Anemonies, Ranunculus's, Crocus's, Tulips, Narcissus, Cyclamens, Iris's, Auricula's, Lilies, Martagons, and Polyanthus's, in Pots or Boxes, filled with rich light Earth, not covering them too deep; they should stand in the morning Sun till Ten or Eleven o'Clock, and no longer. The Seeds of several Kinds of annual Flowers may

may be now sown on warm Borders to stand the Winter. Slip and part the Root of double Rose Campions, Bachelor's Buttons red and white, double Rocket, double Catchfly, and double ragged Robin. These Slips should be planted in shady Borders, and constantly supplied with Water 'till they have taken Root, and then they will be good Plants by the Beginning of October.

Plants in FLOWER.

Some Carnations, Lady-Pinks, Old-Man's-Head-Pinks, Female Balsamine, Amaranthus's, Starwort, and Golden Rods of several Kinds, scarlet and blue Cardinal's Flower, Hollyhocks, Cyclamens, Flos Adonis, Africans, French Marygolds, Sweet Sultans, Indian Scabius, Candy Tuft, Sweet Pea, Tangier Pea, Everlasting Pea; various Kinds of Sun-Flowers, Mallows, Jacea's, Hieraciums, Stramoniums, Tuberoses, Geraniums, Lychnis's, Veronica's, Autumnal Hyacinths, Indian Nasturtium, double Feverfew, Eryngiums, Golden Rods, Alcea's, Helianthemums, double Soapworts, Lupines of several Sorts, Solanums of various Kinds, Phalangiums, Oriental Bugloss, Basil, Capsicum, Cyclamen, Tobacco, and others.

Trees and Shrubs in FLOWER.

Common white Jasmine, Passion Flower, Agnus Castus, Honeyfuckles, Mallow Tree, Laurustinus, Double Virgin's Bower, Trumpet Flower, Angelica Tree, Laurel-leaved Tulip Tree, Traveller's Joy, Musk Rose, Spanish Broom, and some others.

S E P T E M B E R.

Work to be done in the KITCHEN GARDEN.

Prick out Collyflowers that were sown last Month, placing them either in old Cucumber or Melon Beds, about three Inches from Row to Row, and about two Inches asunder; if the Season is cold, make some new Beds of warm Dung. In the Middle of the Month sow Seeds of Cos, *Silesia*, and brown Dutch Lettice, to plant under Frames or Hand Glasses. The Chardons which were planted in June should now be earthed up, tying the Leaves carefully with an Hay-Band: Lay the Earth to the Plants about eighteen Inches high, but not to bury their Hearts: Dry Weather is best for this Work.

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Hoe and clean Turnips, and the Spinage sown last Month, cutting out the Plants where they are too close; weed the Beds of Onions, Carrots, Cabbage Plants, and Coleworts, which were sown last Month. In dry Weather earth up the Celery as it advances in Height, but not above the Hearts of the Plants. At the End of the Month transplant Lavender, Rosemary, Stachas, &c. that they may take Root before the Frost comes to hinder them. Continue to sow Salad Herbs in a warmer Situation; gather all Sorts of Seeds as they ripen. In moist Weather transplant Colewort Plants sown in July into Places where they are to remain till Spring.

Transplant late sown Endive to Borders under warm Walls, Pales, or Hedges, to stand till February before it is blanch'd. In dry Weather tie up full-grown Endive to blanch it for Use. At the End of the Month transplant Lettices to warm Borders, that they may cabbage early in the Spring; cut down the Haulms of Asparagus that begin to wither, and add rotten Dung from Cucumber or Melon Beds where it is wanted. At the End of the Month plant Beans, and sow early Pease; transplant your latter Crops of Celery into Drills, in a drier Ground than formerly, to remain till Spring: Transplant the last Crop of Broccoli that is to remain, and draw the Earth up to the Stems of former Crops, to protect them from the Frosts.

Work to be done in the FRUIT GARDEN.

Gather your Fruits as they grow ripe, for those that are fit to eat this Month seldom continue long good. Towards the End of this or Beginning of the next Month, most Sorts of Winter-Fruit will be fit to gather; but it will be best to let them grow on the Trees as long as the Weather will permit, or till the Mornings begin to be frosty. Towards the End of the Month, when the Weather is moist, transplant Fruit-Trees though the Leaves are not fallen, such as Cherries, Nectarines, Peaches, Summer Pears and Apples; but the later Sorts of Fruits should not be transplanted till the next Month. At the End of the Month prune Cherries, Peaches, Nectarines, Grapes, Figs, especially if their Leaves begin to decay.

At the End of the Month in moist Weather transplant Strawberries, Raspberries, Gooseberries and Currants. This

is the best Season to plant the Cuttings of Gooseberries and Currants, which are better than Suckers. Fruit-Trees against the Wall of your forcing Frame, must be pruned and trained close to the Wall or Espalier, that their Buds may be preparing for the Season of applying Heat.

Work to be done in the FLOWER GARDEN.

Dig the Borders, and if they require it, add some fresh Earth or very rotten Dung, and plant all Sorts of hardy Flowers therein; transplant your biennial and triennial Flowers, which were sown and transplanted in the Flower Nursery, into the Border of your Flower Garden, where they are designed to flower. Plant early Tulips in a warm Situation, sheltered from cold Winds, in which Places they will flower in *March* or earlier. Plant choice Hyacinths in a Bed prepared with good Earth as before directed; then take Earth out of the Bed about six Inches deep, and making the Bottom level, draw Lines across, at the Distance they are to be placed; then place the Roots exactly in the Middle of each Square, and lay the Earth on them gently, so as not to displace the Roots. The Beds must be filled up five Inches above the Top of the Bulbs.

In the Beginning of the Month plant ordinary Double Anemonies in warm Borders, screened from cold Winds, and then they will flower early in the Spring: Slip and plant out Polyanthus's, Primroses, *London* Pride, Thrift, Catch-fly, Pinks, Peach-leaved Bell Flower, Scarlet Lychnis, Rose Champion, Pyramidal Bell Flower, Perennial Blue Bottles, Flag-leaved Iris, and all Sorts of hardy fibrous rooted Plants, which are propagated by parting the Roots, closing the Earth fast to the Roots.

Sow the Seeds of Polyanthus's and Auricula's in Pots or Boxes of Light, rich Earth, not burying the Seeds too deep. At the End of the Month plant choice Anemonies, Ranunculus's, and Tulips in showery Weather; they should be six Inches asunder, and the Anemonies and Ranunculus's should be covered two Inches with Earth over the Tops of the Roots, and the Tulips six Inches. Towards the End of the Month transplant most flowering Trees and Shrubs; part and plant all the Sorts of the Flag-leaved Iris, Peonies, Aconites, Asphodel Lilies, Lily of the Valley, Double Meadow Sweet, Solomon's

Seal,

Seal, Columbines, Daiesies, *Canterbury Bells*, that have well rooted in the Spring.

Plants in FLOWER.

Annual Stock-gilliflowers, Scabious's, sweet Sultan, female Balsamine, *French Marygolds*, Hollyhocks, Lupines, sweet-scented Pease, double Sneezewort, Saffron, autumnal Crocus's, Cyclamens, autumnal Narcissus, *Guernsey Lily*, autumnal Hyacinth, Asters, Golden Rods, double Sope-worth, double Camomile, Larkspur, Tree Primrose, Polyanthus's, Spiderwort, Auricula's, Snap-dragon, Ox-eye, scarlet Bean, several Sorts of Sun-flowers, Eupatoriums, Heart's Ease, red Garden Valerian, and some others.

Trees and Shrubs in FLOWER.

Jasmine, monthly Rose, Musk Rose, Passion-flower Pomegranate with double Flowers, Mallow-tree, *Laurustinus*, Honeyfuckles, *Agnus Castus*, and some others.

OCTOBER.

Work to be done in the KITCHEN GARDEN.

Transplant brown *Dutch* and Cabbage Lettices into warm Borders, near Walls, Pales or Hedges; as also some Cos, Silesia and Imperial Lettices, on all Sorts of Beds, to be covered with Mats or Frames in the Winter. Plant Beans and sow Pease in dry Grounds, warmly situated, twice this Month, at the Beginning and latter End. After the Middle transplant Collyflowers where they are to remain all Winter. Plant two at a Time under one Handglass or Bell, and if they both live to the Spring, one of them must be transplanted out. Cabbage Plants which were sown in the Beginning of *August* must now be transplanted for good.

Some of the Colewort. Plants which were lately sown must be now planted out for Spring Use. Collyflowers sown in *May* will now begin to shew their Heads, therefore look at them often to break down some of their inner Leaves upon them, which will protect them from Frost and Wet. Earth up the Stems of your Broccoli Plants to protect them from Frost. At the End of the Month cut down the Leaves of Artichokes close to the Earth

Earth, and trench the Ground between them, laying a good Ridge of Earth over each Plant, and bury some very rotten Dung between the Rows. Sow Radishes on warm Borders to come early in the Spring.

Make some moderate Hot-beds to plant Mint and Tansy in, and then you will have both at *Christmas*. The Quarters of the Kitchen Garden should now be dunged, and always remember to keep all Places free from Weeds.

Work to be done in the FRUIT GARDEN.

Gather Grapes in dry Weather when there is no Moisture on the Vines; those that are to be preserved should be cut with a Joint of the Vine, and hung up in Rows, so as not to touch, in a warm Room, where Fires are pretty constantly kept, and then they will keep till *February*.

Transplant all Sorts of Fruit-Trees when the Soil is dry, but you should not head down those Trees which are designed for Walls and Espaliers till the Spring; but prune the Roots and cut off all the small Fibres; and when the Trees are planted their Branches should be fastened to the Wall, Pales or Espalier, and some Mulch should be laid on the Surface of the Ground about their Roots. Plant Gooseberries, Strawberries, Raspberries and Currants, that they may take Root before Winter, and then they will produce Fruit the following Summer.

Currant-bushes should be pruned, and their Branches tied up with a Withy; the Ground between them may be planted with Coleworts and Cabbage Plants to remain till Spring. Preserve the Stones and Kernels of Fruits for Propagation. Gather your choice Winter Pears, and lay them on a Heap for eight or ten Days, then wipe them carefully, and put each Sort in a separate Basket closely covered over to keep out the Air.

Work to be done in the FLOWER GARDEN.

At the Beginning of the Month finish planting all Sorts of Flower-roots which are to be put into the Ground before *Christmas*, as, Tulips, Anemonies, Ranunculus's, Crocus's, Jonquils, Hyacinths, Narcissus's, bulbous Iris's, Mortagons, Orange Lily, and all such that have been kept above Ground since their Leaves decayed in Summer.

Now transplant most Sorts of hardy tuberosé-rooted or fibrous

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fibrous-rooted Plants, such as Hollyhocks, *Canterbury* Bells, *French* Honey-suckles, Columbines, Monk's-hoods, Daisies, Bupthalmums, Polyanthus's, Sweet-williams, *London* Pride, Campanula's, Asters, Golden-Rods, Spiderwort, Asphodel, Wall-flowers, Thalictrum, Eringiums, Thrift, perennial Sun-flowers, great Blue-bottles, Iris's, Jacea's, double Feverfew, double Camomile, Ox-eye Daisies, Doronicum, Cirsiums, Cassida or Scull-cap, everlasting Pea, perennial Astragalus's, hardy Apocynums, perennial Poppy, yellow and *Tangier* Fumitories, Bean-caper, Fox-Gloves, horned Poppy, perennial Navelwort, Lychnidea's, *Candy* Alysson, Tree-primrose, dwarf Sun-flower, perennial Geraniums, St. *Peter's* Wort, Violets, Honeysy or Satten-flower, Globe Ranunculus, Lyfimachia's, dwarf Cistus's, Lychnis, Coronaria, ragged Robin, and other Sorts which may be planted in the Borders of the Flower Garden.

The Pots and Boxes of seedling Flowers should now be removed out of their shady Situation, and placed where they may enjoy the Benefit of the Sun as much as possible. Remove Pots of choice Carnations under Cover, setting the Pots close together in a Garden frame, or upon a Bed arched over with Hoops, that they may be covered with Mats in bad Weather.

Take the decayed Leaves off Auricula's, and lay the Pots on one Side that they may not take too much Wet. Remove most Sorts of flowering Shrubs and Trees, for they will now take Root before Winter, laying some Mulch on the Surface of the Ground round their Stems. Clean the Walks from fallen Leaves before they rot, for they will discolour the Gravel. Prune all Sorts of flowering Shrubs, and take away the Suckers that come from their Roots.

Plants in FLOWER.

Several Sorts of Starworts, four or five Sorts of Golden Rods, autumnal Crocus's, yellow autumnal Narcissus, *China* Pinks, sweet Sultans, Polyanthus, three-coloured Violets, Stock-gilliflowers, dwarf Sun-flower, Snap-dragon, Saffron, double Feverfew, sweet-scented Pease, Lupines, double Thorn-apple, Sun-flowers and others.

Trees and Shrubs in FLOWER.

Strawberry-tree, late flowering Honeysuckle, Passion-flower, monthly Rose, Musk-rose, flowering Raspberry, double Pomegranate, Grounself-tree and others.

N O V E M B E R.

Work to be done in the KITCHEN GARDEN.

The Collyflower Plants and Letices that are under Glasses or Frames should have as much Air as possible in mild dry Weather, by taking them off, and by raising them in wet Weather. Likewise sow Pease and plant Beans in dry Weather, and draw up Earth to the Stems of those that are come up. Sow all Sorts of Salad Herbs on moderate Hot-beds. In dry Weather take up full-grown Endive, and lay it in Trenches to blanch, on the Sides of Ridges that the Wet may run off. Likewise earth up Celery to blanch it.

Trench the Ground for early Crops, laying it in Ridges. Sow Carrots and Radishes on warm Borders near Pales and Hedges. Make Hot-beds for Asparagus to come at *Christmas*. Take up the Roots of Carrots, Parsnips, Potatoes, &c. towards the End of the Month, and lay them in Sand in a Place defended against Frost and Wet.

Work to be done in the FRUIT GARDEN.

Divest Fig-trees of all their late Fruit, and nail the Shoots of Trees close to Walls, if there is a severe Frost place some Panels of Straw before them.

Fruit trees planted the former Months for Standards should be carefully staked, and those against Walls and Espaliers should be fastened thereto, to prevent their being displaced by the Violence of the Wind. Clear your Strawberry-beds from the Weeds and Runners, and dig up the Alleys between the Beds, spreading a little Earth or rotten Dung between the Plants if needful.

Work to be done in the FLOWER GARDEN.

Place the Pots and Boxes of bulbous-rooted Flowers in a warm Situation, where they may enjoy the Sun, and be screened from cold Winds. The Beds of Seedling-bulbous-rooted Flowers, which were not removed the last Season, should be raked over to prevent Weeds and Moss from

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The GARDENER'S CALENDAR. 367

from growing thereon, and some fresh Earth should be spread over their Surface. Turn your Compost which has been prepared for Pots and Borders, that the Parts may be equally mix'd, and have the Benefit of the Air and Frost. Likewise prepare fresh Compost for the following Year.

Plants in FLOWER.

Some Sorts of Starworts, two Sorts of Golden-Rods, annual Stock Gilliflower, Saffron, autumnal Crocus, Heart's Ease, Perennial Sunflowers, and Polyanthus-Narcissus.

Trees and Shrubs in FLOWER.

Strawberry Tree with Flowers and ripe Fruit, Laurustinus, Musk Rose and Passion-Flower.

D E C E M B E R.

Work to be done in the KITCHEN GARDEN.

Pick Snails out of the Holes of old Walls and from under Pales, Hedges, broken Pots or other Rubbish. Sow Salad Herbs on a moderate Hot-Bed. When the Weather is mild uncover your Colliflower Plants in the Day-time, and pick off all decayed Leaves. In dry Weather earth up Celery to blanch it. You may now make Hot-beds for Asparagus, which will be ready the latter End of January. Take Cabbages and Savoys designed for Seed, and hang them in a dry Room to drain them of Moisture, and plant them in warm Borders, leaving only the upper Part of their Heads above Ground.

Work to be done in the FRUIT GARDEN.

Examine the Trees in the Orchard, and cut off all dead Branches, and such as cross each other, making the Wound sloping and as smooth as possible. You may also dung and plough the Ground of your Orchard between the Trees, which will cause the Fruit to be much fairer and better tasted.

Work to be done in the FLOWER GARDEN.

Cover the Beds of Anemonies, Ranunculus's, and Hyacinths in wet or frosty Weather; as also choice Carnations and Auricula's. In mild Weather dig and prepare your Beds and Borders ready for planting Flower Roots in the Spring.

Plant

Plants in FLOWER.

Some single Anemonies, Polyanthus's, Primroses, Stock Gilliflowers, narrow-leaved Golden-Rod, and sometimes Snow-Drops.

Trees and Shrubs in FLOWER.

The Strawberry Tree, Spurge Laurel, *Glaftonbury* Thorn, upright blue-berried Honeysuckle, and in mild Weather Mezereon.



Of FARRIERY,

Or the Method of curing the DISEASES of HORSES.

THE best Method of treating Horses is never to bleed, purge, or to give them any other Medicine, unless in Cases of Necessity; but to keep them in Health by *suitable Feeding, careful Dressing, and daily Exercise*; the *best Hay* should be procured, if possible; *Beans* are the strongest Nourishment, but are most fit for laborious Horses. *Bran* is fit for sick Horses, but weakens those that are well. *Oats* are a more hearty Food than *Barley*, as appears from Experience. Horses who eat their Litter should have cut Straw and powder'd Chalk given them to correct their Appetites.

When Horses have been *surfeited*, they should be turned into salt Marshes, which will keep their Bodies open, and cure them of several slight Disorders. When they have *stiff Limbs, swell'd Legs, or Wind Galls*; likewise when their Feet have been hurt by *Quitters*, or bad Shoeing, it will be proper to give them a Summer's Grass for a Month or two, but not in Grounds which are much dung'd. When they are kept abroad in the Winter, they should have a proper Shed to cover them, and Hay to go to at all Times.

If Horses are costive when taken from Grass, mix Bran and chop'd Hay with their Corn, and a Feed of scalded Bran now and then till their Bodies become open. In-crease

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crease their Exercise by Degrees, Some give Antimony to sweeten their Blood, and kee the Body open, but it should be finely powder'd. Others give half an Ounce of the Liver of Antimony for the same Purpose.

When Horses are soil'd in the Stable, the Herbage should be young, tender, full of Sap, and cut every Day, be it of what Kind it will. If they lose their Flesh by this Diet, they should have one that is more solid. With Regard to the feeding of young Horses, they should be more indulged than those that are at Maturity, and if they have but little Exercise, lessen their Quantity of Hay, and put a little fresh Straw in the Rack to prevent their nibbling the Manger. A Horse should never be rode hard after he has had a Bellyful of Meat and Water. After violent Exercise Care should be taken that he cools not too fast, nor drinks cold Water.

When *Coach-Horses* are on the Road, first give them Bran with a few Beans, and then their Oats, which will prevent their scouring.

Directions for BLEEDING, PURGING, and CLYSTERS.

Horses well fed, and that stand much in the Stable, will require *Bleeding* now and then, especially if their Eyes look heavy, dull, red, or inflamed, or feel hotter than usual. *Young Horses* should be bled when they are shedding their Teeth; as also such as have Colds, Fevers, Bruises, Strains, Hurts in the Eyes, and Inflammations of every Kind; likewise when they are fleshy at Grass, or their Looks are heavy. Two or three Quarts of Blood is always enough to be taken away at one Time. It ought to be measured.

Purging is often necessary when the Horse is gross, or has any Disorder in his Bowels. Purges seldom work in less than twenty-four Hours, and those that are improperly given, will cause excessive Gripings, and cold Sweats, which are sometimes fatal.

If Horses are kept much in the Stable without Exercise, they should have a mild Purge or two after Bleeding, especially in the Spring, their Diet should be lower'd, and scalded Mash given them. When Horses fall off their Stomach, a mild Purge or two will likewise be proper.

When Horses have Humours flying about, occasioning Lameness, they should be purged frequently, and take Medicines

Medicines that thin the Blood. Purges given in small Quantities, mix'd with other Medicines, will turn Alteratives of great Use. Purges consisting of Mercury require great Care and warm Cloathing.

Purges should be given early in the Morning on an empty Stomach; and three or four Hours after it a Feed of scalded Bran, and a Lock or two of Hay may be put into the Rack. Give him two more Mashs the same Day, but if he refuses them let him have raw Bran, and take Care that his Water be Milk warm. Early the next Morning give him another Mash, and as much warm Water as he will drink, riding him gently about properly cloathed; this should be done two or three Times a Day. At Night give him a Feed of Oats mix'd with Bran. He should have Plenty of warm Water to drink, but if he will not take it, give him cold.

For a Purge, "Take Cream of Tartar and Aloes, of each an Ounce; of Jalap two Drams; of powder'd Cloves a Dram; of Syrup of Buckthorn, enough to make them into a Ball." Sportsmen give the following: "Take ten Drams of Aloes; Myrrh and Ginger, of each half an Ounce; Saffron and Oil of Aniseed, of each half a Dram."

Horses of gross Constitution should have half an Ounce of *Castile* Soap added to either of the former; or give two Drams of Calomel over Night, mix'd with half an Ounce of Diapente, and the Purging Ball the next Morning.

When you would purge a fine delicate Horse, the following mild Physic will be proper. "Take an Ounce of the best Aloes; half an Ounce of powder'd Rhubarb; a Dram of grated Ginger. Make them into a Ball with Syrup of Roses."

The following is a cooling Purge. "Take two Ounces of Sena, infuse it in a Pint of boiling Water for two Hours; then add four Ounces of *Epsom* Salt, and two Ounces of Cream of Tartar. This is good in all inflammatory Cases.

When an Horse is over-purg'd, you must stop it with an Ounce of Diascordium, dissolved in a Pint of red Port Wine, and repeat it once in twelve Hours, if there is Occasion. When a Horse has taken bad Physic, which makes him swell, or when it proceeds from catching Colds,

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give him the following Ball to promote Urine. "Take Venice Turpentine, one Ounce, mix it well with the Yolk of an Egg; then add an Ounce of Salt-Petre, Juniper Berries, and good Aniseeds, of each half an Ounce; of unrectified Oil of Amber, two Drams; make them into Balls with Syrup of Marsh-Mallows, of an oval Shape, and of the Size of a Pullet's Egg." This Rule should be observed in making all Sorts of Balls.

When you have a Design to give a Horse *Clysters*, in costive Disorders, a small Hand well-oil'd should be passed up his Fundament, to bring away the hardened Dung. Then the Clyster should be administered with a Pipe and Bag, which is better than a Syringe, because this last will make the Horse start, and cause him to return the Clysters immediately.

Emollient Clysters are better in Fevers than purging ones; and nourishing Clysters will save a Horse's Life, when his Jaws are locked up with Convulsions. The Quantity should be a Quart, or at most three Pints, and be repeated often. They may be made of Sheeps Heads, Trotters, Meat Broths, Milk Pottage, Rice Milk strained, and the like nourishing Things.

When an emollient Clyster is wanted, use the following. "Take a large Handful of Camomile Flowers, and of Marshmallows, Bay Berries, and sweet Fennel Seed, of each an Ounce, boiling them in a Gallon of Water to three Quarts. Pour the Decoction into a Pan, and then add half a Pound of Treacle and a Pint of Linseed Oil. If you would have it laxative, add four Ounces of Lenitive Electuary, or rather four Ounces of *Epsom Salt*."

For a *purging Clyster*, "Take Mallows, Marsh-Mallows, and Camomile Flowers, of each a Handful; of Sena an Ounce; of Bitter Apple, half an Ounce; Bay Berries and Aniseeds bruised, of each an Ounce. Boil these in three Quarts of Water, for a Quarter of an Hour; pour off the Decoction, and then add four Ounces of Syrup of Buckthorn, and half a Pint of Linseed Oil."

This last is good to promote an immediate Discharge in all Cases that require speedy Relief, as in symptomatic Fevers, and an Inflammation of the Lungs.

When an *astringent Clyster* is wanted to stop excessive Purging,

Purging, or a spontaneous Looseness, the following astringent Clyster will be proper. "Take of the Rind of Pomogranates, or Oak-Bark, two Ounces; of Leaves of red Roses, green or dry, a Handful; of Balustines, half an Ounce; boil them in two Quarts of Water, till near half is consumed; then pour off the Decoction, and dissolve four Ounces of Diascordium therein."

Of C O L D S.

When a Horse has caught Cold, he is heavy and dull in Proportion to its Severity; the Eyes are commonly moist and watery; there is a Swelling of the Kernels about the Ears and under the Jaws; a Gleetings of the Nose, and a Rattling in the Throat when he breathes. When the Cold is violent there is a working of the Flanks, a feverish Heat, a Loathing of hot Meat, and a Refusal of Water.

In slight Colds when the Horse pricks up his Ears, moves briskly in the Stall, and is but little off his Stomach, take away two Quarts of Blood, keep him warm, and give him Feeds of scalded Bran, with as much warm Water as he will drink. If notwithstanding this the Cold increases, take away two Quarts more. Then infuse two Ounces of Aniseeds, and a Dram of Saffron in a Pint and a half of boiling Water, pour off the clear Liquor, and mix it with four Ounces of Honey, and two Ounces of sweet Oil, and give it the Horse every Night. When there is a Fever omit this, and give him two Ounces of Salt-Petre in his Feed or Water; and when he is costive, administer the emollient Clyster.

The following pectoral Ball is very good in these Cases when there is no Fever. "Take Aniseed, Carraway-Seed, and the greater Cardamums in fine Powder, of each an Ounce; of Flower of Brimstone two Ounces; of Turmeric in fine Powder, an Ounce and a half; of Saffron two Drams; of Spanish Juice of Liquorice dissolved in Water two Ounces; of Oil of Aniseeds half an Ounce; of Powder of Liquorice an Ounce and a half; of Wheat Flour enough to make a stiff Paste; out of which make oval Balls of the Size of a Pullet's Egg." Give one at a Time pretty frequently.

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This Method with good Nursing, hot Mashcs, and good Cloathing, will cure the most sudden Colds. When the Horse feeds heartily, and snorts after coughing, daily moderate Exercise will compleat his Recovery.

Of FEVERS.

When a Horse has a Fever he is very restless, and ranges from one End of the Rack to the other; his Flanks bear, his Eyes are red, his Tongue parched, his Breath short, is hot, and smells strong; he nibbles his Hay, but does not chew it; he smells the Ground frequently; his Body is hot; his Dung comes from him frequently in small Bits and hard; he sometimes stales with difficulty, and his Urine is of an high Colour; he seems to be thirsty, but drinks little at a Time, his Pulse is full and hard, beating fifty Strokes in a Minute.

In the Cure take away two or three Quarts of Blood, and then give him an Ounce of Salt-Petre made into a Ball with Honey thrice a Day. Or you may give him two Ounces of Salt of Tartar, and one Ounce of Sal Ammoniac dissolved in two Quarts of Water every Day. Mix this with a Pail of common Water; and put in it a Handful of Bran to correct the Taste.

His Diet must be scalded Bran mixed with Water, giving him a little at a Time; but if he refuses it, give him dry Bran sprinkled with Water, or put a Handful of picked Hay into the Rack. Give a little lukewarm Water pretty often; his Cloathing should be moderate; too much is pernicious.

If in a Day or two he begins to pick a little Hay, and eats his Bran, he needs nothing more besides Nursing; but if he refuses to feed, take away more Blood, and give him the following Fever Drink. "Take Balm, Sage, and Camomile Flowers, of each a Handful; of Liquorice Root sliced, half an Ounce; of Salt-Petre, three Ounces; of Saffron, two Drams: Infuse them in two Quarts of boiling Water; when it is almost cold strain it off, and add the Juice of two or three Lemons." The Dose is a Pint four Times a Day.

If his Dung is knotty and dry, give him the *emollient Clyster* every Day; or you may omit the Clyster, and give him the following laxative Drink in its Room. "Take of

" Cream of Tartar, four Ounces ; of Epsom Salt, two Ounces ; dissolve them in Water." When his Appetite returns, walk him abroad in the Air, and allow him Plenty of clean Litter in the Stable.

Sometimes there is a *slow Fever*, with Lowness of Spirits and Languishings, with Heat inwardly and Cold outwardly, which sometimes changes to Heat all over ; his Eyes are moist and languid ; his Mouth is continually moist ; he eats but a Mouthful at a Time, and seldom, and has little Inclination to drink. His Body is generally open ; his Dung is soft and moist ; he stales often, sometimes a little, sometimes much.

Begin the Cure by taking away a Quart of Blood or more. After this, give him a Pint of the above Fever-Drink, with the Addition of an Ounce of Snake-Root, and three Drams of Camphire. The Salt-Petre may be omitted, for it is too cooling in these low Cases. The Camphire must be dissolved in Spirit of Wine before it is mixed with the Drink.

Give him nothing but scalded or raw Bran sprinkled, and now and then give him a Handful of choice Hay in your Hand, if he cannot lift his Head to the Rack. He should drink freely of warm Water, or at least with the Chill taken off.

If the aforesaid Symptoms increase, " Take Contrayerva Root, Myrrh, and Snake-Root in Powder, of each two Drams ; of Saffron, a Dram ; of Mithridate, half an Ounce. Make them into a Ball with Honey, and give it him twice or thrice a Day, with two or three Horns of the Infusion of Snake-Root." Some prescribe Vinegar, but it is too cooling in low Fevers. If this Ball fails, add a Dram of Camphire to each. If the Horse should be costive, or loose and weak, you must have Recourse to the Clysters already prescribed.

When his Body and Legs swell, give him the following Ball to promote Urine. " Take of Salt-Petre an Ounce ; Juniper Berries, and Venice Turpentine, of each half an Ounce. Make them into a Ball." Give him two or three of these Balls at proper Intervals, with a Decoction of Marsh-Mallows sweetened with Honey. If these fail, the Case is desperate.

When the Fever *intermits*, or is originally an *intermitting Fever*, give an Ounce of the Jesuits Bark mixed with Honey

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Honey every six Hours, for five or six Times. If he breaks out, so much the better.

Of the PLEURISY and INFLAMMATION of the LUNGS.

When a Horse has the *Pleurisy*, he shews great Uneasiness, and shifts about from Place to Place. The Fever at first is moderate, but rises high of a sudden. In the Beginning he would fain lie down, but starts up again immediately, and frequently turns his Head towards the affected Side. This last is a Symptom of the *Gripes*; but then he frequently lies down and rolls. Add to these, that his Ears and Feet are burning hot, his Mouth parched and dry, his Pulse hard and quick, and he has a Disposition to cough.

The Symptoms of an *Inflammation of the Lungs* are the same, only he is less active in the Beginning, and never attempts to lie down, and a roapy Slime runs plentifully out of his Mouth. Likewise a reddish or yellowish Water runs from his Nose, which sticks like Glue to the Inside of his Nostrils. In a *Pleurisy* a Horse heaves and works violently at his Flanks; but in this Disease he shews a Fulness, the working of his Flanks is regular, and his Ears and Feet are generally cold.

The Cure of both these Diseases is the same. Take away three Quarts of Blood the first Day, two the next, and one the next after that. If the Symptoms do not abate, it must be repeated soon, for the chief Dependence is on speedy Bleeding; but be sure do not forget to rub a blistering Ointment all over his Brisket on the foremost Ribs, for this is very efficacious. Likewise let him have Rowels on each Side the Breast, and one in his Belly. In an Inflammation of the Lungs, rub in the Ointment on both Briskets.

Inwardly give him the following Ball. "Take Sperma Ceti and Salt-Petre, of each an Ounce; of Oil of Ani-seed thirty Drops; of Honey enough to make a Ball." After this Ball give him a Pint of Decoction of Figs and Liquorice Root. When there is a dry short Cough, three Horns of the Decoction must be given three or four Times a Day, with four Spoonfuls of Honey and Linseed Oil. The *emollient Clyster*, with the Addition of two Ounces of Salt-Petre, should be injected once every Day. If he still

continues hot and short-breathed, purge him with the following Clyster. "Take Sena, and Marsh-Mallows, " of each two Ounces; Fennel and Bay Berries, of each " an Ounce. Boil them in five Pints of Water to four, " pour off the clear Liquor, and then add four Ounces " of Epsom Salt, three Ounces of Syrup of Buckthorn, " and half a Pint of Linseed Oil."

It must be observed, that these Diseases terminate in Life or Death in a few Days; for unless the Horse expectorates, he will soon be suffocated. For Diet, he must have a Quartern of scalded Bran, with a Spoonful of Honey and Flower of Brimstone every Day, with two or three small Feeds of Oats sprinkled with Urine. When he has recovered his Strength, give him the Purge with Rhubarb.

Of a COUGH and ASTHMA.

When a Horse has a *moist Cough* his Flanks have a sudden quick Motion, he breathes thick, wheezes, rattles in the Throat, and sometimes throws up thick white Phlegm, especially after drinking: This is a *moist Asthma*. When the Horse is full of Flesh, bleed plentifully; if otherwise sparingly; then give him the following alterative purging Ball: "Take Galbanum, Gum-Ammoniac, and " *Affa-foetida*, of each two Drams; of fine Aloes, an " Ounce; of Oil of Aniseed, two Drams; Oil of Amber, " one Dram: make them into a Ball with Honey." This may be repeated at proper Intervals for some Time, and if the Cough is obstinate, give the following Ball on the intermediate Days in the Morning, and every Morning for some Time afterwards.

"Take of Cinnabar of Antimony, or common Cinnabar in very fine Powder, six Ounces; Galbanum, " Gum-Ammoniac, and *Affa-foetida*, of each two Ounces; " of Garlick four Ounces; of Saffron half an Ounce; " make them into Balls with Honey.

A *dry Cough* or *Asthma*, is known by his coughing almost incessantly, at particular Times, without bringing up any Thing, most in a Morning after drinking; in other Respects he is well. In the Cure, first bleed, then give him two Drams of Calomel, mixed with an Ounce of Diapente, for two Nights, and the next Morning a purging Ball,

Of FARRIERY.

377

Ball, keeping him well clothed and littered, and feed him with scalded Bran and warm Water. In eight or ten Days repeat the Calomel Ball over Night, and the Purge the next Morning; then give one of the following Balls every Morning, and let him fast two Hours after it.

“ Take of Cinnabar half a Pound; of Gum-Guaiacum four Ounces; Myrrh and Gum-Ammoniac, of each two Ounces; of *Venice* Soap half a Pound: mix them with Honey, or Oxymel of Squills, to make Balls.

Of a BROKEN-WIND.

This Disease is incurable, but may be prevented, for it is preceded with an obstinate Cough, and the Horse eats his Litter, and drinks much Water. When this is evident, bleed him, and give him the Calomel Ball as above, which should be repeated two or three Times; then give the following Balls, which are to be continued some Time.

“ Take of *Aurum Mosaicum*, in fine Powder, eight Ounces; Myrrh and Elecampane, in Powder, of each four Ounces; Anniseeds and Bay-Berries, of each an Ounce; of Saffron half an Ounce; make them into Balls with Oxymel of Squills.” Some give three Cloves of Garlick in every Feed. The Horse should be always abroad in the Field when the Disease is confirmed.

Purisy, thick winded Horses may be cured by giving them two Spoonfuls of Tar mixed with the Yolk of an Egg, two or three Times in a Week (especially when they travel) in a Morning fasting.

Of a CONSUMPTION.

When a Horse is in a *Consumption*, his Eyes look dull, the Ears and Feet are generally hot, he coughs by Fits, he sneezes much, attended with Groaning, his Flanks have a quick Motion, and sometimes a yellowish curdled Matter proceeds from his Nose; he will eat Corn, but cares little for Hay.

Take a Pint of Blood away at a Time, and repeat it as often as his Breathing is oppressed; likewise mix an Ounce of the following Powder with his Feed twice a Day, after it is wetted. “ Take Cinnabar, Gum-Guaiacum and Salt-Petre, of each a Pound, and make them into a fine Powder.” Spring Grasse, and more especially salt Marshes, are excellent in this Disease.

Of the Apoplexy, Staggers, Convulsions, Lethargy, Epilepsy, and Palsey.

The Forerunners of the APOPLEXY or STAGGERS are a Drowfiness, full watry Eyes, a Disposition to reel, Feebleness, bad Appetite, and a hanging down of the Head, or resting on the Manger. When the Disease comes on, he drops down suddenly without Sense or Motion, except a Working of the Flanks.

The Cure must be attempted by striking the Veins in several Parts at once, till he has bled four or five Quarts, supporting his Head and Shoulders with Plenty of Straw; if he survives the Fit, cut several Rowels, and give a purging Clyster Night and Morning: Blow a Dram of the Powder of Asarabacca up his Nose to make it run; after this two or three Purges; then an Ounce of equal Parts of Antimony and Crocus Metallorum for a Month; or the same Quantity of Cinnabar and Gum-Guaiacum.

In the EPILEPSY, or falling Sickness, the Horse reels and staggers; his Eyes are fixed in his Head, his Urine and Dung come away of their own Accord; he runs round, and falls suddenly; sometimes he lies like a dead Horse, except the Motion of his Flanks. He may continue three Hours in the Fit, and then recover. When he comes to himself he generally foams at the Mouth. If he is young and full of Blood, bleed and give him the nervous Balls mentioned below.

In the LETHARGY the Horse generally rests his Head with his Mouth in the Manger, and his Poll is commonly reclined to one Side. He is inclined to eat, but generally falls asleep with the Meat in his Mouth. Emollient Clysters are necessary in this Case, and the following *nervous Ball*: "Take of Asia-fœtida half an Ounce; of Russia "Castor, in Powder, two Drams; of Valerian Root, in "Powder, an Ounce; make them into a Ball with Honey. Give this twice a Day, with a Pint of the Decoctation of Mistletoe, or wild Valerian Root, sweetened with Honey. His Body should be kept open with laxative Purges and Clysters.

When the Horse is seized with CONVULSIONS, he raises his Head with his Nose towards the Rack; his Ears are pricked up, his Tail cocked, and he looks like a hungry Horse; after this his Neck grows stiff, cramped, and almost immoveable. If he continues thus a few Days,

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his Muscles will be pulled and cramped, with snorting, sneezing, panting, and Shortness of Breath till he drops down dead. You must bleed him plentifully, unless he is poor, old, or lately come off hard Labour; then give him the nervous Ball before-mentioned in the same Manner.

If any of these Diseases arise from Bots or Worms, then give the Horse the following Ball. "Take Calomel and Philonium, of each half an Ounce, make them into a Ball with Conserve of Roses, and give them immediately." Half the Quantity may be repeated in four or five Days.

Likewise give three or four Horns of the following Infusion three or four times a Day, "Take of Pennyroyal and Rue two large Handfuls; of Asia-fœtida an Ounce; Saffron and Liquorice sliced, of each two Drams; infuse them in two Quarts of boiling Water, and pour the Liquor off as it is wanted." When the Symptoms abate, give the nervous Ball. When the Jaws are locked up so that they cannot easily be opened, give the following Clyster once a Day. "Take of Valerian Root an Ounce; Rue, Pennyroyal, and Camomile Flowers, of each a Handful; boil them in five Pints of Water to four, and in the strained Liquor dissolve an Ounce of Asia-fœtida." See Clysters. Rubbing the Horse well in all Parts every two or three Hours will yield great Assistance, especially where the Muscles are contracted. In desperate Cases half an Ounce of Opium should be added to the Clyster, giving nourishing Clysters at the same Time. When the Horse's Mouth is thus opened, *Gibson* says he has given about two Scruples of Opium, with an Ounce of Asia-fœtida, to perfect the Cure; which is above 30 times more than a Man may venture to take.

When a Horse has lost the Use of a Limb by the *Palsey*, besides the Use of the Internals above-mentioned the following Ointment should be rubbed into the Parts affected. "Take of Oil of Turpentine four Ounces; Nerve Ointment and Oil of Bays, of each two Ounces; of Camphire one Ounce; of rectified Oil of Amber three Ounces; of Tincture of Cantharides an Ounce; rub the Camphire well into the Ointment, and then mix the Ingredients together." When the hind Parts are affected, rub it into the Back and Loins.

The

The following is an Infusion for the Palsy. "Take
 " Snake Root, Contrayerva, and *Valerian* Root, of each
 " half an Ounce, Mustard-seed and Horse-Radish scraped;
 " of each two Ounces; of Long Pepper two Drams; in-
 " fuse them in three Pints of Wine or strong Ale." Two
 Horns of this may be given with the nervous Ball, or the
 whole Quantity may be taken by itself in a Day.

When any of these Disorders are attended with a Con-
 tiveness, the great Gut should first be emptied by a small
 Hand, and then emollient oily Clysters should be thrown
 up; after this give a laxative Purge

Of the STRANGLES and VIVES.

Colts and young Horses are most subject to the *Strangles*,
 which begins with a Swelling between the Jaw Bones,
 which sometimes extends to the Muscles of the Tongue;
 it is attended with extraordinary Heat, and an Inflamma-
 tion, insomuch that the Horse can hardly swallow till it
 breaks. The most dangerous Kind is when the Horse runs
 at the Nose.

The Intention of Cure is to cause the Swelling to break
 speedily, and therefore keep it constantly moist with Oint-
 ment of Marshmallows, covering the Head and Neck with
 a warm Hood.

To hasten the Breaking, apply the following suppurative
 Poultice twice a Day pretty hot. "Take of Leaves
 " of Marshmallows ten Handfuls; of white Lily Roots
 " half a Pound; of Linseed eight Ounces; boil them in
 " two Quarts of Water till they are all pulpy, and then add
 " four Ounces of Ointment of Marshmallows, and Hog's
 " Lard enough to prevent it from growing dry"

These generally cause the Swelling to break in five or
 six Days; then apply the following digestive Ointment
 spread on Tow, and the Poultice over that. "Take Ro-
 " sin and *Burgundy* Pitch, of each a Pound and a half;
 " Honey and Turpentine, of each eight Ounces; of yel-
 " low Wax four Ounces; of Hog's Lard one Pound; melt
 " them together, remove them from the Fire, and then
 " stir in an Ounce of Verdigrease, in fine Powder, till it
 " grows stiff."

When a Fever endangers a Suffocation, bleed moderate-
 ly, and give him warm Mash,es, and plenty of warm Wa-
 ter. When a Horse runs at the Nose, give him an Ounce
 of Jesuit's Bark every Day for some Time.

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The *Vives* are swellings of the Kernels under the Ears, which vanish without breaking, by moderate Bleeding, warm Clothing, and anointing the Part with Ointment of Marsh-mallows.

Of the Diseases of the EYES.

When Blows, or other external Injuries, cause the Eye-lid to swell much, with a Running, bleed immediately, and apply Conserve of Roses, mixed with Vinegar, a little Bole, and the White of an Egg; when the Swelling is abated, dissolve half an Ounce of white Vitriol in a Pint of Spring Water, and bathe the Eye and Eye-lid three or four Times a Day with a clean Sponge dipt in this Water, or with a Feather, leaving a few Drops on the Eye. If the Veins under the Eye are full, open them with a Lancet.

When the Coats of the Eye, from the same Causes, lose their Transparency by an Inflammation, then Bleeding may be repeated, and a Rowel will be necessary; likewise give him scalded Bran, and the cooling, opening Drink mentioned in Fevers. If a Film or thick Slough should remain, it may be taken off by blowing equal Parts of white Vitriol and Sugar-candy into the Eye. Some recommend a few Drops of the Juice of Celandine for this Purpose.

Wounds of the Eye may be dressed with Honey of Roses alone, adding after a few Days an eighth Part of the Tincture of Lead.

Moon Eyes, or Cataracts, generally appear when the Horse is turned of five; at which Time one Eye becomes clouded, the Eye-lids swell, and are very often shut up: A sharp corrosive Water runs from the Eye; the Veins of the Eye and under the Nose, are full and turgid: When the Cataract is ripe, the Running disappears; sometimes there is no Running, or closing of the Eye-lids. This is called a *dry Cataract*, wherein the Eyes appear sunk and perishing.

This is seldom cured but by the alterative Powder with Cinnabar and Gum-Guaiacum, which may possibly do good if made up into a Ball with Hog Lice. An Ounce and a half must be given every Day. Likewise you may mix half an Ounce of Asarabacca, in Powder, with two Drams of Turbith Mineral, and blow as much as will lie on a Sixpence up his Nostrils every Day.

The

The *Hæms* is a spongy Swelling in the inner Corner of the Eye; Part of this must be cut away, and the Wound dressed with Honey of Roses. If any proud Flesh arises, it should be sprinkled with burnt Alum.

Of the GLANDERS.

This is a Disease of the Membrane on the Inside of the Nose attended with a Discharge of Matter from the Nostrils of different Colours, sometimes with Streaks of Blood; when it is of long Standing it turns blackish, and stinks, There is likewise a Swelling of the Kernels under the Jaws. The Cure of this Disorder depends on opening the Part affected with a Trepan, and sawing off the injured Bone; but this is properly the Work of a Person well skilled in making such Operations, and therefore I shall say no more of it here.

Of the GRIPES.

Pains in the Bowels may arise from Wind, or an Inflammation, of the dry Gripes. The Windy Cholic is known by the Horse's lying down, and rising again with a Spring; he strikes his Belly with his hinder Feet, stamps with his fore Feet, and refuses his Meat. Violent Gripes produce convulsive Twitchings, a turning up of the Eyes, and lying like a dead Horse.

In the Cure dip a small Hand in Oil, and empty the strait Gut, to make Way for the Wind, and to ease the Neck of the Bladder, that the Horse may stale. Bleed in the Neck, and give the following Ball and Clyster.

"Take *Venice* Turpentine and Juniper-Berries, of each half an Ounce; of Salt-Petre an Ounce; of Oil of Juniper a Dram; of Salt of Tartar two Drams; make them into a Ball with Syrup of Sugar."

Let this be washed down with a Horn or two of Ale. If the Horse does not break wind, give him another Ball in an Hour or two; and a third if necessary, trotting him gently.

The following Clyster may be given with the Balls, or alone.

"Take of Camomile Flowers two Handfuls; Fennel, Aniseed, and Coriander Seeds, of each an Ounce; of Long Pepper half an Ounce; boil them in three Quarts of Water to two; then add half a Pint of Gin, half a Pint of Oil of Camomile, and half an Ounce of Oil of Amber."

When

When the Pain is very violent give him the following Drink to ease it.

" Take two Ounces of *Venice Treacle*; two Drams of the saponaceous Pill; one Dram of Camphire dissolved in a little Spirit of Wine; an Ounce of Powder of Aniseed; mix them with a Pint and a half of Ale for a Clyster."

When the *Cholic* proceeds from an *Inflammation*, besides the former Symptoms, the Horse is hot, pants, with a Dryness of the Mouth, and a Fever; the Water likewise is scalding hot. In this Case take away three Quarts of Blood, and if the Symptoms do not abate, repeat the Bleeding in a few Hours. The emollient Clyster, with two Ounces of Nitre, should be thrown up twice a Day, and a Pint of the following Drink should be given every two Hours.

" Take three Ounces of Sena, and half an Ounce of Salt of Tartar; pour a Quart of boiling Water over them; let them stand for an Hour or two, then strain off the Liquor, and add two Ounces of Lenitive Electuary, and four Ounces of *Epsom Salt*." If these fail, the Case is desperate.

The *Dry Gripes* proceed from Costiveness, in which the Horse strives to dung, but cannot, or what comes away is black and hard. His Urine is high-coloured, and he is very restless and uneasy.

In this Case the straight Gut should be emptied with a small Hand dipt in Oil; the emollient, oily Clyster should be given twice a Day, as also the above purging Drink till the Bowels are unloaded.

The Diet for a Horse in the Gripes should be scalded Bran and warm Water-Gruel.

Of the LAX and SCOURING.

A Lax is not always to be stopt, particularly when a healthy Horse has taken cold, has been rid hard, or has eaten bad Food, or has a slight Fever; it should rather be encouraged with warm Water Gruel and a laxative Ball: But if it continues long with Gripings, and the Mucus of the Bowels comes away, with a Loss of Appetite, it is high Time to stop it.

When the Purging is attended with a Fever, give half an Ounce of Rhubarb, with an Ounce and a half of Lenitive Electuary; and at Night half an Ounce of *Diascordium*.

cordium, in a Pint of red Wine mulled, with Cinnamon. Repeat this every Day, and the Rhubarb Ball once in two or three.

If the Distemper increases, give an Ounce of Diascordium: If it still grows worse, give an Ounce of Roch-Alum with an Ounce and an half of Bole, and a Pint of red Port. When Slime comes away, with Gripping, give the following Clyster.

“ Take two Quarts of Milk, half a Pint of Salad Oil, the Yolks of six Eggs well beaten together, and three Ounces of coarse Sugar, mix them.”

Of WORMS and BOTS.

Bots in the straight Gut often come away with the Dung, and Worms and Bots in the Stomach often cause Convulsions. They are to be killed in the Manner taught in the Account of the Staggers, repeating the Dose at proper Intervals. Bots in the straight Gut may be cured by giving the Horse a Spoonful of Savin, cut very small, every Day with his Oats or Bran; to which may be added three or four Cloves of Garlic. Likewise give a Purge with Aloes now and then; or you may give half an Ounce of Æthiops Mineral, or rather *Aurum Mosaicum*, once every Day.

Of the YELLOWS or JAUNDICE.

This is known by the Yellowness of the Eyes, and the Inside of the Mouth. He is dull, refuses his Meat, has a slow Fever, with hard, dry, pale, yellowish Dung, and Urine of a dirty brown Colour, looking red when settled. The off Side of the Belly is sometimes hard and swelled.

When the Distemper is fresh, and the Horse young, bleed plentifully and give the laxative Clyster: The next Day give him an Ounce and a Half of Rhubarb, two Drams of Saffron, and six Drams of Aloes, made into a Ball with Syrup of Buckthorn; or instead of the Rhubarb take an Ounce and an Half of Cream of Tartar, half an Ounce of *Spanish Soap*, and four Drams of Aloes. This may be repeated two or three Times, and the following Balls and Drink on the Days they are omitted.

“ Take of Æthiops Mineral half an Ounce, the same Quantity of Hog Lice, and an Ounce of *Castile Soap*, and make them into a Ball,” washing it down with the following Drink: “ Take Maddar Root and Tur-

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"meric, of each four Ounces; of Burdoc Root sliced half
"a Pound; of Monks Rhubarb four Ounces; of Lique-
"rice sliced two Ounces: Boil them in a Gallon of Smith's
"Forge Water to three Quarts; strain off the Liquor, and
"sweeten it with Honey." Three or four Ounces of
Castile Soap and Turmeric given in a Day will do alone.
They must be made into Balls.

If these fail, give Calomel in the Manner already men-
tioned two or three Times, and then the following Balls.

"Take of Salt of Tartar two Ounces; of Cinnabar
"four Ounces; Hog-Lice and Filings of Steel, of each
"three Ounces: of Saffron half an Ounce; of *Spanish*
"Soap half a Pound: make them into Balls with Honey,
"and give one, Night and Morning with a Pint of the
"above Drink.

Of the STRANGURY, DIABETES, and PISSING of BLOOD.

A Horse that has the *Strangury* makes frequent Motions
to stale; he stands wide and straddling, and looks full, with
distended Flank. In this Case bleed largely, and give him
the following Drink every two Hours, two or three Times,
till he is reliev'd. "Mix an Ounce of *Venice* Turpentine
"with the Yolk of an Egg first, and then with six Drams
"of Salt-Petre, half a Pint of sweet Oil, and a Pint of
"white Wine."

He may likewise have Plenty of the Decoction of Marsh-
Mallows, in which an Ounce of Salt-Petre is dissolved, an
Ounce of Gum-Arabic, and two of Honey.

A Horse that stales profusely, which is called a DIA-
BETES, if weak and old, is seldom cured, for they soon
lose their Flesh and their Appetite, and have a staring
Coat: There is more Hopes of a young Horse. After
shortening his Allowance in Water and moist Food, give
him a Pint of the following Drink three Times a Day.

"Take of Jesuits Bark four Ounces; Bistort and Lor-
"mentil Root, of each two Ounces; Gum Arabic eight
"Ounces; boil these in two Gallons of Lyme-Water to
"one."

Besides this, let him have two or three Quarts of Lime-
Water in a Day. If these fail, give him a Quart of strong
Allum Posset-Drink thrice a Day.

This Method is likewise proper for a Horse that PISSES
BLOOD, with often Bleeding a little at a Time.

OF MOLTEN GREASE.

Molten Grease is an oily Discharge with the Dung, attended with a Fever, Heat, Restlessness, Starting, Trembling, and Shortness of Breath; when it is extremely greasy, it will end in a Scouring; the Blood will have a thick, fatty, yellowish Skin over it when cold, the Crassamentum, or thick Part, is so greasy, it will not stick to the Fingers. He soon falls away, and if he recovers, is Hide-bound.

In the Cure bleed plentifully, and for two or three Days successively, in smaller Quantities; put in two or three Rowels, and give the cooling, emollient Clyster, which should be thrown up daily. Let him drink Plenty of warm Water, in which Salt-Petre is dissolved.

When the Fever is gone, and the Horse has recover'd his Appetite, give him the following *alterative Purge* once a Week to bring down his swelled Legs. "Take Succotrine Aloes and Gum-Guaiacum, of each half an Ounce; Daphoretic Antimony and Myrrh two Drams; make these into a Ball, with Syrup of Buckthorn."

OF SURFEITS, MANGE, and being HIDE-BOUND.

A Horse is said to be surfeited when his Coat stares and looks rusty and dirty: The Skin is full of mealy Scales and Dander, which lies thick among the Hair. Some have Hurdles like Pease or Tares. Some have dry Scabs all over their Bodies. The Horse is constantly rubbing himself, and makes himself raw. Some appear only lean and Hide-bound.

In the dry Kind take away three or four Pounds of Blood, and then give the alterative Purge just mentioned, every Week or ten Days. In the intermediate Days give an Ounce of the following Powder Morning and Evening. "Take of Cinnabar half a Pound; of crude Antimony, in fine Powder, four Ounces; of Gum-Guaiacum four Ounces; make a Powder." This should be continued till the Horse's Coat is well. If the little Scabs do not peel off, anoint him with the mercurial Ointment sold by the Apothecaries, keeping him dry, and giving him warm Water to drink. This Ointment and purging will often do alone.

A *wet Surfeit* is when the Sores run, in which Case the Neck sometimes swells in one Night, and pours forth a great

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great Quantity of a thin Humour, which if not corrected will produce the *Poll-Evil* or a *Fistula*.

First bleed plentifully, and give cooling Physic once a Week; that is, four Ounces of Lenitive Electuary, and as much Cream of Tartar, or six Ounces of *Epsom* Salt alone dissolved in Water-Gruel in a Morning fasting: After three or four of these Purges, give two Ounces of Salt-Petre made up into a Ball with Honey, every Morning for a Fortnight, and if beneficial, for another Fortnight: The Powder above-mentioned should be given with the Horse's Corn, and continued a long while.

When the Horse is *Hide-bound*, his Diet should be cool and opening, and have an Ounce of Fenugreek Seeds mix'd with his Feeds for a Month, or longer. As this Disorder often proceeds from Worms, give the Things directed in that Disorder, and afterwards the Cinnabar-Powder above-mentioned.

When a Horse is *mangey*, his Skin is generally tawny, thick and full of Wrinkles; the little Hair that remains on the Loins and Tail stands upright, the Ears are commonly without Hair, as well as the Eyes and Eye-brows. However, the Skin is never raw, nor peels off.

To cure it rub the Parts with Flower of Brimstone and Hog's Lard mix'd together, or equal Quantities of Brimstone, Train-Oil and Tar. In very obstinate Cases some mercurial Ointment may be mixed therewith.

Of the FARCY.

The *Farcy* is properly a Distemper of the Blood-Vessels, for small Swellings like Grapes or Berries spring out over the Blood-Vessels: In the Beginning they are hard, but soon turn into soft Blisters, which discharge oily or bloody Matter, and turn into very foul Ulcers. In some Horses it appears in the Head, in others in the external Jugular-Veins. In others in the Plate-Vein running down the Fore-Leg towards the Knee, and often upwards towards the Brisket: Some have them in the Hind-Parts about the Pasterns, along the large Veins on the Inside of the Thigh, rising upwards into the Groin and towards the Sheath; sometimes it is on the Flanks, spreading towards the lower Belly.

The *Farcy* that appears on the Cheeks and Temples looks like Net-Work, or creeping Twigs full of Berries; in some it influences the Eye, or little Blisters or Buds run

on the Side of the Nose; sometimes along the Small on the Outside of the Shoulder; sometimes a few small Buds appear near the Withers, and on the Outside of the Hip.

When the Horse is fat and full of Blood, bleed largely at first; but if the Horse is low in Flesh, loosing too much Blood will be hurtful. After bleeding give him six Ounces of Nitre every other Day for a Week, and then three Ounces a Day for three Weeks or a Month. Anoint the Buds and Swellings with the following Ointment twice a Day.

“ Take of the Ointment of Elder four Ounces; of Oil of Turpentine, two Ounces; of Sugar of Lead, half an Ounce; of white Vitriol powdered, half a Dram; mix them together in a Galley-Pot.

When they break and run, if the Matter be thick and well digested, they will soon be well: When little Lumps remain, give the Horse two Ounces of the Liver of Antimony in a Day for a Fortnight, and one Ounce a Day for another Fortnight.

When the *Farcy* affects the large Blood-Vessels, bleed on the opposite Side, and apply the following Liniment to the chorded Vein. “ Put six Ounces of Oil of Turpentine into a Pint Bottle, and drop three Ounces of Oil of Vitriol gradually into it; that is, when you have dropt a little into it, let it have done smoking before you drop any more, otherwise the Bottle will burst ”

But when the *Farcy* is seated in the loose fleshy Parts of the Belly, it will be necessary to add as much Oil of Vitriol as there is Oil of Turpentine: Rub the Mixture over the Buds twice a Day, and continue it till the Buds digest and the Chord dissolves. When the Lips and Edges of the Ulcer are not thick or callous, you may expect a speedy Recovery. To confirm the Cure, give the Liver of Antimony as above directed, or crude Antimony.

When the *Farcy* begins on the Flanks, or towards the lower Belly, it may be known by the Hair which stands in Tufts all round the Buds or Blisters, and the Matter that issues out is purulent, and of a clammy greasy Consistence. First rub in either of the Mixtures, and then to prevent the Swelling of the lower Belly apply the following Mixture all over the Side affected to the Center of the Belly.

“ Take of rectified Spirit of Wine, four Ounces; of the Mixture of Oil of Vitriol and Oil of Turpentine, four Ounces; White-Wine Vinegar, or old Verjuice, six Ounces; mix them carefully together.” When

When the *Farcy* is in the Pasterns, it is not a smooth Swelling like the Grease, but begins in the Pastern Joint usually with one Bud, and runs upward like a knotted Crab-tree Stick. A Poultrice with Bran and Verjuice bound round the Part, and renewed once a Day, has often stopt it. If proud Flesh arises, touch it with Oil of Vitriol, or Aqua-fortis, an Hour before you apply the Poultrice.

When the Distemper grows inveterate, rub a moderate Quantity of the following Mixture into the chorded Vein, and wherever there is a Swelling proceeding from the *Farcy*, once in two or three Days.

“ Take Linseed Oil, half a Pint; Oil of Turpentine and
“ Oil of Petre, of each three Ounces; of the Tincture of
“ Euphorbium and Hellebore, of each two Drams; of the
“ green Ointment, two Ounces; of Oil of Origanum,
“ half an Ounce; of double Aqua-fortis, half an Ounce;
“ after the Ebullition is over add two Ounces of *Barbadoes*
“ Tar, and shake the Bottle gently to mix them.”

When the Skin is so much thickened over the Ulcer as to confine the Matter, or if the Orifices are choked up with proud Flesh, a Passage must be open'd with a small hot Iron, cauterising the Sides, and destroying the fungous Flesh round the Edges; after which it may be kept down as often as it sprouts, with Oil of Vitriol. When moist Sores and Ulcers want to be incarnated, pour a little Aqua-fortis upon Quicksilver in a Marble Mortar to the Consistence of a Liniment; smear the Ulcers with this when they are foul and rank.

Inwardly give the following Balls once or twice a Day for two or three Months together. “ Take of Cinnabar
“ of Antimony, eight Ounces; long Birthwort and Gum-
“ guaiacum, four Ounces; make them into a Paste with
“ Honey, and make Balls of the Size of a large Walnut,
“ and roll them in Liquorice Powder; when the Distemper
“ is new it will cure it in a Week's Time.

The *Water Farcy* is a dropical Disorder, and the Water shews itself in several Parts of the Body with Swellings which yield to the Pressure of the Fingers. This may be cured by slight Scarifications on the Inside of the Leg and Thigh, and three or four Strokes on the Skin of the Belly on each Side the Sheath: This will cause the Water to drip away, and soon relieve the Horse: Then purge with an Ounce of Succotrine Aloes, two Drams of Jalap, half

an Ounce of *Epsom Salt*, and sixty Drops of Oil of Juniper made into a Ball with Honey.

Another Sort is the Consequence of a feverish Disorder, and appears in Tumours, which are commonly hot and sometimes inflamed; sometimes they break, and discharge a little scalding Water, at other Times they disappear without breaking.

The Cure is to bleed plentifully in the Beginning, and administer a cooling Drink every other Morning for one Week, with half an Ounce of Antimony and as much Gum-guaiacum once a Day, in a Feed of scalded Bran, which may be continued a Week longer if necessary.

Of STRAINS in various Parts.

When a Horse is strained in the Shoulder, he is said to be *Shoulder-slipt*, though improperly, for there is no such Thing; to discover it you may trot him in Hand, and then instead of putting the lame Leg forward in a right Line, he forms a Circle therewith, and when he stands in the Stable, that Leg will be advanced before the other.

To cure this Disorder, first bleed the Horse, and let the whole Shoulder be bathed three Times a Day with hot Verjuice or Vinegar: But if the Lameness continues with Swelling or Inflammation, rub the Part well with the *Opodeldoc*, after two or three Days rest; or either of the following Mixtures.

Mixtures for Strains. Take of camphorated Spirit of Wine, two Ounces; of Oil of Turpentine, one Ounce; mix them: Or, take of the best Vinegar, half a Pint; Spirit of Vitriol and camphorated Spirit of Wine, of each two Ounces; mix them, well together.

When the Shoulder is very much swelled, foment it in Woolen Cloths large enough to cover the Whole, wrung out of hot Verjuice and Spirit of Wine, or a strong Decoction of Rosemary, Bay-leaves and Wormwood; to a Quart of which add a Pint of Spirit of Wine.

When the Strain is violent and the Swelling large, put a Rowel in the Point of the Shoulder. Astringent Poul-tices are also proper to abate the Swelling, made up with Bran, Oatmeal or Rye-Flour, boiled up in Vinegar with Lard enough to prevent its growing stiff, bathing the Part twice a Day as above.

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Pepper, four Ounces, *Winter's Bark*, Caraway-seeds, Bay-berries and Juniper-Berries, of each two Ounces; Laver-der-flowers, Rosemary and Marjoram, of each one Ounce; of rectified Spirit of Wine, three Pints; digest it before the Fire for ten Days, strain off the Tincture, and then add, of *Spanish Soap* a Pound and a half, of *Barbadoes Tar* four Ounces, Oil of Turpentine eight Ounces, Oil of Amber two Ounces; mix and make a Liniment.

In *Strains* of the *Coffin Joint*, when the Horse will only touch the Ground with his Toe, and the Joint cannot be played with the Hand, the only Method is repeated Blistering, and then Firing superficially.

Strains in the *Back Sinews* may be known by the Swelling which sometimes reaches from the Backside of the Knee down to the Heel, and the Horse generally sets that Leg before the other. In this Case bathe the Tendon three or four Times a Day with hot Vinegar; if much swelled, apply the Poultices recommended above, and when the Swelling is down bathe it with one of the Mixtures, rolling up the Tendon with a proper Bandage, or a laced Stocking; when there is a Disposition to the Grease, Curriers Shavings dipt in Vinegar have been found useful.

When the *Knees* and *Pasterns* are much swelled after a Strain, apply the Poultice, and then bathe with one of the Mixtures; when a great Weakness remains, turn him out to Grass.

When a Horse is lame in the *Stifle*, he treads on his Toe and cannot set his Heel to the Ground; treat him at first with Vinegar and cooling Restrictants; if a large Swelling with Puffiness ensues, foment the Part as above, and then bathe with the Mixtures of Opodeldoc.

A Lameness in the *Whirlbone* and *Hip* is discovered from the Horse's dragging his Leg after him, and dropping backward on his Heel when he trots; when the Muscles only are affected, he may be cured as before; but when the Ligaments of the Joints are affected, the Cure depends upon Rest and Time.

Strains of the *Hock* are to be treated with Coolers and Repellers, but when the Ligaments are hurt use the Fomentation; the remaining Hardness is to be remov'd with repeated blistering.

OF ULCERS.

A *simple Ulcer* may be cured by washing it with Spirit of

of Wine, and then dressing it with Pledgets, spreading them with a Digestive of Turpentine and Honey; when there are small Pimples, mix every four Ounces of the Digestive with a Dram of Verdigrease, in fine Powder, and apply once a Day; if the Running is small once in two Days is sufficient. If the *Ulcer* is of a faint red Colour, mix a Dram of Precipitate with every two Ounces of the Digestive; when the *Ulcer* is deep, the following Ointment will be proper.

“ Take four Ounces of Turpentine and the Yolks of
 “ two Eggs, incorporate them well together, and then add
 “ half an Ounce of Myrrh and two Drams of Frankin-
 “ cense in fine Powder; bring them to the Consistence of
 “ an Ointment with Tincture of Myrrh.

Wash the *Ulcer* first with the Tincture of Myrrh, and then apply the Ointment once a Day; any of the *Basilicom* will serve to fill it up with Flesh; but if this is difficult, give an Ounce of equal Quantities of Antimony and Gum-guaiac every Day,

When the *Ulcer* breeds proud Flesh, dress it with equal Quantities of red Precipitate and burnt Alum.

Cavernous, sinuous and fistulous *Ulcers* are to be laid open, and then cured by eating away the Callosities if any.

Of a BONE SPAVIN.

A *Bone Spavin* is a bony Excrecence, or hard Swelling, growing on the fore Part of the Hock of an Horse's Leg. To cure this, first cut the Hair as close as possible, and then apply the following blistering Ointment pretty thick over the Part.

“ Take Nerve and Marshmallow Ointment, of each two
 “ Ounces; of Quicksilver killed with Turpentine, one
 “ Ounce; of *Spanish* Flies powdered, a Dram and a half;
 “ of Mercury sublimate, a Dram; of Oil of Origanum,
 “ two Drams; mix them.”

The Horse, after the anointing in the Morning, should be kept tied up all Day without any Litter till Night, and a Pitch or Sticking Plaster should be bound over it before he is suffered to lie down; when the Blister has done running, it may be applied a second Time, which in Colts or young Horses will make a perfect Cure. In old *Spavins* it may be repeated several Times, but with some Distance of Time between. When the *Spavin* lies very deep it may be cauterised with an Iron in the Shape of a Fleam,
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with little Danger of injuring the Tendons or Ligaments, and then it may be kept running by a mild blistering Ointment; the Iron must be forced pretty deep into the Substance of the *Spavin*.

Of a CURB and RING-BONE.

As a *Spavin* arises from the Bone on the Fore-part of the Hock, so a *Curb* proceeds from the Juncture of the same Bones, from the Hinder part, forming a pretty large Tumour over the Back-part of the Hind leg, attended with Stiffness. and sometimes with Lameness.

The Cure may be effected at first by blistering repeated two or three Times, or oftener: If this does not succeed, the quickest and surest Way will be to fire it with a thin Iron, making a Line down the Middle from the Top to the Bottom, and other Lines on each Side like a Feather: Afterwards apply a mild Blister over the Part, and that will be sufficient.

A *Ring-bone* is a hard Swelling of the lower Part of the Pasterns, which generally reaches half Way, or more, round its Fore-part, somewhat like a Ring. Ring bones that appear in Colts and young Horses will often disappear of themselves; but when the Substance remains it will generally give way to blistering; if otherwise it may require both blistering and firing; this last should be performed with a thinner Instrument than the common, and let the lines be made a Quarter of an Inch distant, crossing them obliquely somewhat like a Chain; this done apply a mild Blister over all; when this has done running, lay on the Rupture Plaister, to be had at Apothecaries.

Of SPLENTS.

These are hard Excrescences which grow on the Shank-Bone, to which young Horses are most subject: If these neither disfigure a Horse, nor cause Lameness, the best way is to let them alone; if they are bathed with Vinegar or old Verjuice at their first Appearance it will stop their Growth, for the Disease lies in the Skin or Membrane that covers the Bone.

Mild Blisters often repeated will frequently take them away; if they fail, and the *Splent* is near the Knee or Joints, fire and blister in the same Manner as in the *Bone-spavin*. *Splents* on the back Part of the Shank-bone should be

be bored in several Places with an Iron, not very hot, on account of the back Sinews that cover them: Then fire them the common way, making the Lines not very deep.

Of the POLL-EVIL.

The *Poll-Evil* is an Abscess near the Pole of a Horse in the Sinus's between the *Noll-Bone* and the uppermost Vertebra of the Neck: When it proceeds from external Hurts, bathe the Swelling often with hot Vinegar; if the Hair is fretted off, use two Parts Vinegar and one of Spirit of Wine: If there is an Itching with Inflammation, first bleed and apply a Poultrice of Elder flowers, and white Bread and Milk; these with a little Physic will frequently disperse the Swelling.

When there is Matter in it, lay on ripening Poultrices elsewhere mentioned, till it bursts of itself; if you open it with a Knife, take care not to hurt the Ligament that runs under the Mane. When a great Quantity of Matter runs from it like melted Glue, make another Incision, especially when any Cavities are discovered by the Finger or Probe. The Wound should be dressed with the common Digestive of Turpentine, Honey, and the Tincture of Myrrh: After this, wash the Sore with the following Mixture made hot, and fill up the Cavity with Tow soaked in it.

“ Take of Spirit of Wine, half a Pint; of white Vitriol dissolved in Spring-Water, half an Ounce; of Tincture of Myrrh, four Ounces; mix them.”

But pare off the proud Flesh, if any; likewise beat the Whites of Eggs and Vinegar together; then dip Tow in it, and lay it over the Sore, and it will serve instead of a Bandage.

When the Sore is foul, and the Quantity of Matter great, use the following Mixture,

“ Take corrosive Sublimate, Verdigrease in Powder, and Roman Vitriol, of each eight Ounces; of Honey, two Ounces; Oil of Turpentine and Train Oil, of each eight Ounces; of rectified Spirit of Wine, four Ounces; mix them together in a Bottle.”

Or, instead of this, mix together half an Ounce of Verdigrease, half a Pint of Train Oil, four Ounces of

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the Oil of Turpentine, and two of the Vitriol. This is milder than the former, and has often succeeded.

First, clean the Sore well with a Sponge dipt in Vinegar; then put some of the Mixture into a Ladle with a Spout, and make it scalding hot, then pour it into the Abscess, and close the Lips of it with one or more Stitches; let it remain thus several Days, and if good Matter appears, and not too much, you need do nothing more than bathe it with Spirit of Wine; if the Matter is plenty and thin, scald the Abscess again and again, till the Matter lessens and thickens.

Of BRUISES and FISTULAS in the Withers, WARBLER on the Back, and SIT-FASTS.

Bruises from the Pinches of the Saddle should be bathed well with hot Vinegar three or four Times a Day: If this fails put an Ounce of the Oil of Vitriol into a Quart of Vinegar, or half an Ounce of white Vitriol may be dissolved in a little Water, and mixed with a Quart of Vinegar: Bathe the Swelling with either of these in the same Manner: When the Swelling is attended with hot watery Pimples, use the following.

“Take two Ounces of Crude Sal Ammoniac, and boil it in a Quart of Lime Water, and then add half a Pint of Spirit of Wine.”

After the using of this, anoint the Part with Elder Ointment to smooth the Skin. When these Swellings succeed a Fever, cause them to break with suppurating Poulitices, for they are not to be opened with a Knife; but enlarge the Opening, and pare away the Lips, that the Dressings may be applied more readily. Dress them in the same Manner as the Pole Evil.

If the Bones are foul, dress them with the Tincture of Myrrh, till they scale off.

When this turns to a *Fistula*, the Callosities must be cut out as much as possible with a Knife, and the Remainder must be eaten out with Precipitate, burnt Alum and white Vitriol.

Warbles are small hard Tumours under the Saddle Part of a Horse's-Back, occasioned by the Heat of the Saddle in travelling. A hot greasy Dish-clout applied frequently at first will often remove them: Or camphorated Spirits of Wine, with a little Spirit of Sal Ammoniac.

A Sit-

A *Sit-Fast* is a Warble turn'd horney. If the Mercurial Ointment will not remove it, cut it out and treat it as a fresh Wound.

Of WIND-GALLS, and the BLOOD-SPAVIN.

A *Wind-Gall*, is a flatulent Tumour, and is sometimes seated on both Sides the Back-Sinews, above the Fetlocks in the Fore Legs, but oftner on the Hind Legs.

At their first Appearance they should be bathed twice a Day with Vinegar, or with a Decoction of Oak-Bark, Pomgranate Rind, and Allum boiled in Verjuice, binding over it a woollen Cloth soaked therein. If this fails, lay a little blistering Ointment on every other Day for a Week; this may be continued as often as the Horse can be spared from Business, till the Cure is compleated.

A *Blood Spavin* is a Swelling and Dilatation of the Vein that runs along the Inside of the Hock, and is often attended with Lameness of the Hock. The Astringents and Bandage just mentioned will cure at first. But when this Method fails, by means of a crooked Needle, tie the Vein above and below the Swelling, and the turgid Part will digest away, dressing it with Honey, Turpentine, and Spirit of Wine mix'd.

Of the MALLENDERS and SALLENDERS.

The *Mallenders* are Cracks in the Bend of the Horse's Knee, which discharge a sharp indigested Matter, often occasioning the Horse to stumble, and walk stiff and lame.

The *Sallenders* are the same Disorder on the Bending of the Hough, which occasions Lameness behind.

They may both be cured by washing the Parts with a Lather of Soap warmed, or old Chamber-Lye, and then spreading over the Crack a strong Mercurial Ointment spread on Tow. They should be dressed with this, Night and Morning, till the Scabs fall off. If this fails, "Take "Ethiops Mineral half an Ounce; of white Vitriol a "a Dram; of soft green Wax six Ounces. Mix them." First clip off the Hair, clear away the Scabs, and anoint the Part with this often.

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Of the LAMPAS, BARBS, and WOLVES-TEETH.

A *Lampas* is an Excrecence on the Roof of a Horse's Mouth, which hinders his Feeding. It is cured by cauterising it very superficially with a hot Iron, and anointing it with burnt Alum and Honey.

Barbs are small Excrecences under the Tongue. They must be quite cut off, and then washed with Brandy.

Wolves-Teeth are when they grow out, and wound his Tongue; old Horses are most subject to this Disorder. The best Method of Cure is to file them down.

Of the GREASE.

When a Horse's Heels are first observed to swell in the Stable, and to go down upon Exercise, wash them every Time he comes in with Soap Suds, or Vinegar and Water, which with proper rubbing will often prevent the Grease.

If Cracks or Sores come to ooze or run, clip the Hair away, and begin the Cure with Poultices of boiled Turnips and Lard; as also when the Heels are full of hard Scabs. Then apply the digestive Ointment, with this Poultice over them, to promote a Discharge, and to take down the Swelling. Then a Sponge may be dipped in the following Water, and applied three Times a Day. Then spread the *white Ointment* on Tow; to an Ounce of which add two Drams of the Sugar of Lead.

The *drying Water*. Take white Vitriol and burnt Alum, of each two Ounces; of Egyptian Ointment an Ounce; of Lime-Water a Quart. Mix them.

Of SCRATCHES, CROWN-SCABS, and RAT-TAILS.

Scratches in the Heels may be cured as the Grease, at first with the Turnip Poultice, and a little common Turpentine to relax the Vessels and soften them; then the digestive Ointment for a few Days, and then they are to be dried up with Ointment and the drying Water. Afterwards keep the Heels supple with Curriers dubbing Oil and Tallow. If they are obstinate, with Cavities, first lay them open, and apply the following Ointment.

"Take of Venice Turpentine four Ounces, of Quick-silver one Ounce; rub them together, and add Honey and Sheep's Suet, of each two Ounces."

This must be used once or twice a Day, and if the Horse be full and fleshy, bleed and purge.

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The *Crown-Scab* is a Humour that breaks out round the Coronet of the Foot, attended with a Scurfiness. In the Cure, mix Ointment of Marsh-Mallows with yellow Basilicon, spread them on Tow, and lay it all round the Coronet, giving the Horse a Dose or two of Physic.

Rat-Tails are Excrescences which creep from the Pastern to the Shank. Some are moist, others dry. The moist may be washed with the drying Water for the Grease, and the hard with the Mercurial Ointment of the Shops. If it does not vanish by this Application, use the following Ointment. "Take of black Soap four Ounces, of Quick-Lime two Ounces, of Vinegar enough to make an Ointment." If this fails, pare it off with a Knife, and dress it with Turpentine, Tar, and Honey mixed together.

Of the CANKER.

A *Canker* generally proceeds from Thrushes, and turns the Muscles of the Foot into a Quag, at the same Time rotting the Sole. If it is neglected for a few Days it will grow several Inches high, and when the Slough is taken off, the Part underneath appears of a pale Red, with Inequalities like a Collyflower.

The rising Flesh must be kept down with double Aquafortis, Oil of Vitriol, or Butter of Antimony, with which they should be dressed every Day, and then you will soon get Ground of the Canker, even when it is got into the Coffin Bone. When the Canker does not rise upon the Dressings, once in two Days will be sufficient. Sometimes a little Precipitate, and burnt Alum in fine Powder, should be strewed over the new Growth of the Flesh, till the Sole begins to grow.

The Hoof should be cut off wherever it presses on the tender Parts, and the other Part should be kept very soft with Linseed Oil, and should be bathed all round the Coronet with Chamber-Lye. When the Horse is cured, and is come to his Appetite, he should have two or three Purges.

Of NARROW HEELS and BINDING of the HOOF.

When the Heel is narrow, the best Way is to pare nothing out but what is foul and rotten, and to rub in a little of the following Ointment for the Hoofs into the Sole.

"Take of Bees-Wax three Ounces; of Lard six Ounces; of Tar an Ounce; of Linseed Oil enough to make an Ointment."

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When the *Hoofs* are too dry, stuff them with Bran and Lard mixed together every Night; especially when he is travelling in hot Weather, the Roads being dry and hard. When the Hoofs are too moist, wash them every Day with warm Vinegar or Verjuice.

A Horse is *Hoof-bound* when the Hoof is so tight round the Instep, as to turn the Foot almost into the Shape of a Bell. To remedy this Disorder, draw the Foot down from the Coronet almost to the Toe with a drawing Knife, making seven or eight Lines or Raifes through the Hoof almost to the Quick. Afterwards keep them charged with Pitch or Rosin till the Lines are almost worn out with shoeing. This will require some Months, and yet some will be able to travel in a few Weeks. Some turn their Horses out to Grass till their Feet grow down.

Of SAND-CRACKS and QUITTERS.

A *Sand-Crack* is a little Cleft from the Outside of the Hoof. When this only penetrates thro' the Hoof without touching the Ligament, you must rasp the Edges smooth and apply thick Pledgets of Basilicon, binding them on with a Piece of soft Lint. If you add a little Precipitate to it, the Ointment will be the better. When the Cleft penetrates to the Ligament or Gristle, and there is any Hollowness under the Hoof, rasp it thin and wide from both Sides of the Cleft, and fire it with Irons not made too hot. The Horse should be turned out to Grass, or wintered in a Farm-Yard.

A *Quitter* is an Ulcer formed between the Hair and the Hoof, commonly on the inside Quarter of a Horse's Foot. When it is superficial it may be cured with Cleansing and Dressings, with bathing the Coronet every Day with Spirit of Wine, and dressing the Sore with four Ounces of Basilicon, mixed with two Drams of Precipitate in fine Powder.

When the Matter forms a Lodgment under the Hoof, there is no Way of coming at the Ulcer but by taking off Part of the Hoof; and then the Cure may be effected without Danger. When the Matter lodges near the Quarter, and the Quarter of the Hoof is taken off, the Cure can only be palliative; for as it grows up it will leave a large Seam, which weakens the Foot, yet the Horse will serve for a Cart or Waggon.

Of Wounded FEET from Nails, Gravel, &c.

When Nails, Stubs, Thorns, &c. are got into a Horse's Foot, you should get them out as soon as possible; and after washing the Part with Oil of Turpentine, you may dress the Whole with Lint dipped in Oil of Turpentine and Tar melted together. The Foot may be stopped with heated Bran and Hog's Lard. If the Nail, &c. is not taken clean out, which may be known by the Discharge of Matter; then pare the Sole thin, and enlarge the Hole with a Bit of Sponge Tent, and then draw it out with a Pair of Forceps, or bring it away by Digestion. If these fail, open the Wound with a Drawing-Knife to the Bottom, and then dress it as above directed.

When the Horse is pricked in shoeing, pare the Foot thin on the wounded Side; then dress it with Tar and Oil of Turpentine, and stop it up with Bran and Hog's Lard.

When Gravel hurts a Horse, it generally follows the Nail-holes, and must be scraped. If this is difficult, pare the Sole thin, and if necessary enlarge the Wound to the Bottom, and dress it as in other Cases; when the Coffin Bone is affected, proceed as in the *Quitter*, and bathe the Hoof with Vinegar to cool it.

Of the RUNNING THRUSH or FRUSH.

The *Thrush* is an Imposthume that gathers in the Frog, especially in Horses that have fleshy Heels, and have deep Clefts in their Frogs. The safest Way to cure this is to pare out the hard Part of the Frog, or whatever appears rotten, and to wash the Bottom of the Foot three Times a Day with old Chamberlye.

When this has been neglected, or the Horse has a great Flux of Humours on the Part, it is apt to degenerate into a Canker. To prevent which use the following Mixture.

“Take Spirit of Wine and Vinegar, of each two Ounces; Tincture of Myrrh and Aloes, one Ounce; Egyptian Ointment, half an Ounce. Mix them.”

Whenever there appears a more than ordinary Moisture, bathe the Thrush with this, and lay a little Tow dipped in it over the Ulcer, giving the Horse the first Purge mentioned under the Article of *Purging*.

USE

USEFUL RECEIPTS of various Kinds.

To make BLACK INK.

TAKE three Ounces of good Galls reduced into Powder, which infuse in three Pints of Rain, or River-Water; then set them in the Sun, or in a gentle Heat for two Days; after which add three Ounces of Coperas, and set it in the Sun for two Days more, shaking them together two or three times a Day. Lastly, put in an Ounce of Gum Arabic.

To make SHINING INK.

Take of Gum Arabic and Roman Vitriol, of each an Ounce; of Galls well bruised a Pound; put them into five Quarts of sour small Beer, set them in a warm Place, and shake them often. Pour off the clear, and then add an Ounce of Ivory Black in fine Powder, and a Quarter of a Pint of Seed-Lac Varnish.

To make London INK POWDER.

Take of clear Nut Galls ten Ounces; two Ounces of white Coperas; four Ounces of Roman Vitriol; one Ounce of Gum Arabic. Powder them very fine and sift them. An Ounce of this Powder put into Water will make good Ink. It is very proper to carry to Sea.

To make RED INK.

Take half a Pound of quick Lime and two Quarts of Water, mix them together, and let them stand a Day and a Night, then pour off the clear Water, and put a Pound of Brasil Shavings into it, boil it half away, or till upon Trial the Red Liquor is strong enough to write with. This done, put in two Ounces of Gum Arabic, and one Ounce of Alum; when these are dissolved, strain off the Ink and keep it for Use.

Another Way to make RED INK.

Take a Pint of stale Beer, two Ounces of Shavings of Brasil Wood, half a quarter of an Ounce of Cochineal, two Ounces of Roch Allum, boil them together, pour off the Clear, and then add an Ounce of Gum Arabic.

To write LETTERS of SECRECY.

Write a Letter with the Juice of Onions, and let the Person who is to read it, hold the Paper near the Fire till the Writing appears of a redish Colour, and the Letter may be easily read.

An excellent CEMENT for broken CHINA and GLASSES.

Beat Garlick in a Stone Mortar and squeeze out the Juice, and apply it to the Pieces which are to be joined together, then fix them carefully in their proper Places, and the Seams will be scarce visible.

Another common CEMENT.

Beat the White of an Egg very clear, and mix it with Lime in very fine Powder, join the broken Pieces together with this, and let them stand till they are quite dry.

Another strong CEMENT for broken China Ware.

Take equal Parts of Isinglass, Mastic, and Turpentine; beat them together in a Stone Mortar till they are well united, and then join the Pieces together therewith. They will sooner break in a new than in the old Place. If the Turpentine is not enough to render the other Ingredients of a proper Consistence, add more till it is.

To join BROKEN AMBER.

Anoint the Pieces with Linseed Oil, and hold them as close to the Fire as you can till they stick, and then set them by to dry at leisure.

A certain Method to whiten IVORY.

When Ivory is turned yellow or red with long keeping, boil it in strong Lime-Water, suppose a Pound of Lime to a Quart of Water, and if that has not the desired Effect, add more Lime. This Method never fails to bring it to a proper Whiteness.

To make the very best Kind of VARNISH.

Take of the Bits of Amber, reduced into a Powder, a Pound, and melt it in a Crucible over the Fire. This done pour it on an Iron Plate, and when it is cold powder it again, and mix it with drying Oil, and return it back into the Crucible, then add Spirit of Turpentine enough

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enough to dissolve the whole, and keep it fluid. With this you may varnish Wood, Metals, or Prints, and nothing will hurt them. This has been a Secret hitherto.

A VARNISH for all Sorts of Colours.

Take of Gum Anime an Ounce, of Mastick and Gum Sandarac, of each two Ounces. Reduce them into fine Powder. Put them into a Glass Vessel, and pour a Pint of Spirit of Wine over them. Hang it in the Sun, or set it by the Fire till the Ingredients are dissolved, then filtre the Liquor through a clean Cloth, and keep it in a Vial well corked. When you would use it, mix the dry Colour with some of it, and apply it to your Work.

To make LAC-VARNISH.

Take of clean Gum-Lac, in fine Powder, a Quarter of a Pound, put it into a Glass Bottle, and then pour a Pint of rectified Spirit of Wine over it, and let them stand two Days, shaking them often; on the third set it near the Fire till the Gum is dissolved; then strain it through a Hair Bag and put it up for Use.

To make a LACKER that looks like Gold.

Take of Gum-Lac in Grains eight Ounces; of clear Gum-Sandarac two Ounces; Dragon's Blood and black Rosin, of each an Ounce and half. Beat them to Powder and put them in a Glass Vessel. Pour a Quart of rectified Spirit of Wine over them, and place the Vessel in a very gentle Sand-Heat till most of the Ingredients are dissolved, and when it is cold strain it through a Cloth. This is to be laid upon Tin or Picture Frames, and other Things that have been silver'd three or four times, and they will appear to be gilded.

To make FULMINATING POWDER.

Take three Parts of Salt-Petre, two Parts of Salt of Tartar and one Part of Brimstone; mix them together and reduce them into fine Powder; take half a Quarter of an Ounce of this Mixture, and put in an Alchymy Spoon, or any other that will not melt, and hold over the Fire or a Candle, and it will make a Report like a Cannon.

To make a STONE that will produce FIRE when wetted.

Take Quick Lime, Salt Petre, Alexandrian Tutty, and the Herb called Calamint, of each equal Quantities; Sulphur vivum and Camphire, of each twice as much as one of the rest. Powder them and pass them through a fine Sieve, put them into a Bit of new Linen Cloth and tie them close up; put them into a Crucible, and place another thereon Mouth to Mouth, lute them well together, and set them in the Sun to dry, and when the Powder is dry enough it will look yellow; then put the Crucible into a Potter's Furnace, and it will be turned into a Kind of Brick. When you are desirous of lighting a Candle with it, moisten a Bit of it with your Spittle, and it will instantly flame. When you have used it blow it out again.

To make a PHILOSOPHICAL TREE.

Take of the finest Leaf Silver one Ounce; Aqua-Fortis and Quicksilver, of each four Ounces. Dissolve the Silver and Quicksilver in this Aqua-Fortis, and put the Solution in a large Glass-Vial, then pour a Pint of Water over it and stop it up, and then you will soon see a fine Metallic Tree growing larger every Day.

To make OIL-CLOTH for Hat-Cases and other Uses.

Take drying Oil and set it over the Fire, and then dissolve Rosin in it, or which is better but dearer, Gum Lac. There must be so much of either as will bring the Oil to the Consistence of Balsam. Then add some Colour to it, as Verdegrease for a Green. Umber for a Hair Colour, or White Lead and Lamp Black for a Gray, or Indico and white for a Light Blue. Spread this over Canvas or Linen Cloth so that it may be fully drenched or glazed over with a Brush, and when it is quite dry, no Wet can touch it. That made with Lac and applied to fine Linen, would make good Great Coats for those that travel much in all Weathers. Some have lately laid this Composition upon Silk. These fine Sorts may be rolled up and put in the Pocket, being exceeding proper for Gentlemen or any that ride out with good Cloaths, and would not have them spoiled. Some of this Varnish should be laid on the Seams after the Garment is made, and then no Wet can soak through.

To make fine hard red SEALING-WAX.

Take of Gum-Lack, or Shell Lac half a Pound, melt it in an earthen Vessel, and then add an Ounce and half or two Ounces of Vermilion in very fine Powder; when they are well mixed over the Fire, and are become of a proper Coolness, make them into Sticks or Balls. If you would have a coarser Sort, take half Lac and half Rosin. If a coarser still, take Red-Lead instead of Vermilion.

To make BLACK-WAX.

Use the same Lac in the Manner directed above, only instead of Vermilion, mix it with Ivory-Black.

To make BALLS to take SPOTS out of Linen, Silk, or Woolen.

Take an Ounce of Fullers-Earth, break it in a Stone Mortar, and then drop twenty Drops of Spirit of Turpentine, and twenty Drops of Spirit of Wine among it. Rub them together and make a Ball. Some use Pipe-Makers Clay instead of Fullers-Earth.

The Method of quicksilvering GLASS GLOBES like Looking Glasses.

Take of Quicksilver two Ounces; of Bismuth one Ounce; Lead and Block-Tin, of each half an Ounce. Melt the Lead and Tin together, and then put in the Bismuth, and when that is melted let it stand till the Mixture is almost cold, then add the Quickilver.

Take care that the Inside of the Glass Globe be very clean, and with a Paper Funnel pour in the Mixture very gently, and then move it about that the Mixture may touch every Part; if it does not lie on equally, warm it over the Fire, and then it will flow freely. If the Amalgama or Mixture is too thin, put in a little more Lead, Tin, and Bismuth. The finer and clearer the Globe is the better the Looking-Glass will be.

To make STRAPS for setting RAZORS.

Take a long Piece of Leather, about two Inches broad, that is smooth and clear on the Flesh Side; glue it to a thin Piece of Board of the same Length and Breadth; when it is dry smear it over with a Tallow Candle, and hold it over the Fire till the Grease is soaked into the Leather:
Repeat

Repeat this three Times, and then strew on some Tripoly that is clean washed, and work it into the Leather till the Grease becomes warm, and repeat the same Operation three or four Times, and then the Leather will be fit for Use. Likewise glue some Leather and Tallow on the other Side, and work in some fine powdered Emery, with a Piece of smooth Ivory or a Burnisher. This Strap is extremely useful to give a Razor a fine Edge.

To DUTCHIFY QUILLS.

This is a Method made use of to take the Oil out of Quills, that they may hold Ink the better; it also renders them more hard. Fasten a hard Piece of Leather on your Knee, or a thin smooth Iron Plate; then make a small, clear Fire, and make it hollow between the Bars of the Grate, in such a Manner that a Quill may be put into it without touching the live Coals; put the Barrel of the Quill into this hollow Place for a Second or two, taking care the Fire does no hurt; then lay it on the Iron Plate, and with the Back of a Knife press it hard at the Part next the Feather; at the same Time, with the other Hand, draw the Quill hastily back, and it is done. The Quill will return instantly to its own Shape again.

To clarify QUILLS.

Put an Iron Pot over the Fire half full of fine Sand, and when the Sand is hot, stir it well about that the Heat may be equal; then put in a Bundle of Quills, and take them out from Time to Time to see when they are sufficiently transparent, and then they are enough. This Method is as proper to take the Oil out as the former, but then the Quills are not so beautiful. These are the Methods made use of by the Pencutters in London, who work for the Stationers.

LIME-WATER for the STONE.

Take a Pound of Lime made with Oyster Shells, put it in an earthen Vessel, and pour a Gallon of Water upon it; let them stand four Hours, and then pour off the clear. This drank to the Quantity of three Pints in a Day, beginning in the Morning fasting, is an excellent Medicine for the Stone in the Bladder, It must be continued a considerable Time, or till it breaks and comes away by Urine. It is likewise a good Medicine in the King's Evil, the Diabetes and the Scurvy.

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A good EYE-WATER.

Take of white Vitriol a Quarter of an Ounce, of Spring Water a Quart, and boil them together, till the Vitriol is dissolved. This is good for watry Eyes, for Eyes that are glued together in the Night Time, and for slight Inflammations.

To make TAR-WATER.

Take of Tar two Pounds, of Spring Water a Gallon, put them into a glazed earthen Vessel, stirring them well together with a Stick; let them stand two Days, and then pour off the Water. This drank warm and often, is excellent to cure Fevers, Agues, the Small-pox and Measles, as also in the Scurvy, Jaundice, Rheumatism, and Gout, in which last Cases, it must be drank to three Pints a Day. A Quart a Day drank for a few Months will cure the King's Evil. It is good in a Pleurisy, Ulcers of the Kidneys and Bladder, as well as the Dropsy.

BALSAM for the RHEUMATISM.

Take a Pound of Gum Guaiac, a Spoonful of the Balsam of Peru, and a Quart and half a Pint of rectified Spirit of Wine; when the Gum is dissolved strain off the Balsam. This is a serviceable Medicine in the Rheumatism, Scurvy, Jaundice, sleepy Diseases, and Gleet. The Dose is from 30 Drops to 80 three Times a Day.

BALSAM for Coughs, Cuts, and Green Wounds.

Take of Balsam of Tolu an Ounce; Gum-Guaiac and Benjamin, of each three Ounces; of Storac two Ounces; Succotrine Aloes, Myrrh and Olibanum, of each half an Ounce; of rectified Spirit of Wine two Quarts; powder the Ingredients, and put them into a Stone Bottle with the Spirits of Wine; set the Bottle near enough the Fire, or in the Sun in Summer, for six Days, and the Balsam will be ready. The Dose is from Twenty to Fifty Drops. It is good to raise the Spirits, to cure Coughs, to mend the Appetite, and is excellent in most Disorders of the Breast and Lungs; it is prevalent in the Colic, from a cold Cause, and in common Loosenesses. Outwardly it heals Wounds, Ulcers, and rotten Gums; being applied to an aching Tooth with a Bit of Cotton, it will cure it unless the Tooth be too much decay'd.

A BAL-

A BALSAM for the PALSIE, and Pains of the Limbs.

Take of the Spirit of Rosemary a Pint; of hard Soap three Ounces; of Camphire an Ounce; dissolve the Soap in the Spirit in a gentle Heat, and then it is fit for Use. Rub the Balsam into the Part affected before the Fire.

A DECOCTION for a LOOSENESS.

Take three Ounces of the Shavings of Logwood, and boil them in two Quarts of Water, with a Quarter of an Ounce of Cinnamon, and then strain off the Liquor. This will cure all common Loosenesses, if a Tea-cupful is drank every two Hours.

A REMEDY for an obstinate, violent COUGH.

Buy an Ounce of the anisated Balsam of Sulphur at the Chemists or Apothecaries, and take seven or eight Drops three Times a Day on a Lump of Sugar.

A REMEDY for the PILES.

Take a Spoonful of the Flour of Brimstone in half a Pint of Milk every Morning till cured.

A REMEDY for an AGUE.

Take an Ounce of Jesuit's Bark, and divide it into 16 Parts; then take one Part in a Glass of red Wine every three Hours when the Fit is off. It must be repeated again in eight Days Time.

TINCTURE of ALOES.

Take of the best Aloes two Ounces, of Cinnamon a Quarter of an Ounce, of common Gin nine Quarters; powder the Ingredients, and mix them with the Gin, and let them stand together some Days. This is full as good as the *Tinctura sacra* of the Shops. The Dose is an Ounce. This is a good Purge in low Constitutions, and is good in the Green-Sickness, Scurvy, the Hippo, and for those that drink hard.

The Cordial PURGING-ELIXIR.

Take of Sena two Ounces; Jalap, sweet Fennel Seeds, Juniper Berries, the Shavings of Lignum Vitæ, of each an Ounce; of Molasses Spirit, or Brandy, three Pints; set the Bottle before the Fire for four Days. The Dose is a Spoonful over Night, and two or three the next Morning. The Use of it is known all over the Kingdom, it having the Properties of *Daffy's Elixir*.

DROPS

DROPS for the STOMACH.

Take of Gentian Root an Ounce; of the Outside of *Seville* Orange Peel an Ounce and a half; Cinnamon and Cochineal, of each a Quarter of an Ounce; of *French* Brandy a Quart; steep them for two Days and pour off the Tincture. The Dose is a Tea-spoonful or two in a Glas of Wine before Dinner. It is a good Bitter and very useful in a Loss of Appetite and Want of Digestion.

A PLAISTER to cure CORNS.

Take four Ounces of Gum-Ammoniac, of Quicksilver an Ounce; kill the Quicksilver by grinding it with a little Turpentine in a Stone or Glas Mortar; then melt the Gum-Ammoniac, and stir in the Quicksilver a little before it cools. This is excellent also to lay on hard Swellings to disperse them.

PURGING SALT.

This is nothing but Epsom Salt, of which half an Ounce or an Ounce is a Dose, dissolved in a Tea-cupful of Water. It is a very cheap, safe, and easy Purge. It works without Gripes or Sickness, and is much better than *Glauber's* Salt.

MEAD'S POWDER for the bite of a MAD DOG.

Take of ash-coloured ground Liver-wort two Ounces; of Black Pepper an Ounce; make them into a Powder: Take away 10 Ounces of Blood from the Patient directly, and give a Dram and a half of this Powder every Morning fasting for four Days, in half a Pint of warm Milk. After this he must be dipt in cold Water for 30 Days together before Breakfast. He must first be dipped all over, and continue with Head above Water no longer than half a Minute if it be very cold.



Of ARTIFICIAL FIRE-WORKS.

THE artificial Fire-works most in use are ROCKETS, which consist of a Cylindrical Case of Paper filled with combustible Ingredients, which being tied to a Stick mount in the Air to a considerable Height, and there burst. This Kind is commonly called a *Sky-Rocket*.

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410 Of ARTIFICIAL FIRE-WORKS.

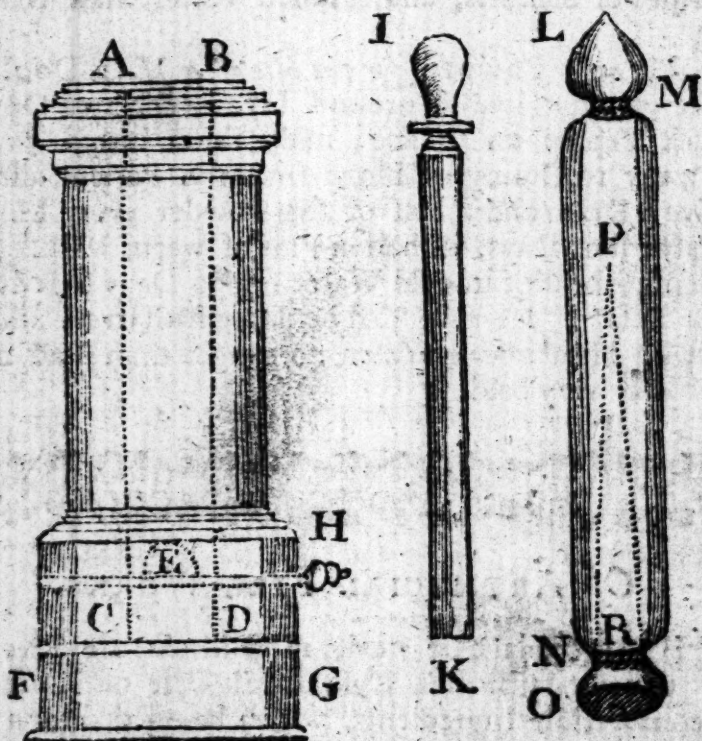
The Cases to make Rockets in are generally made of hard Wood that will not split, which must be made of several Sizes, according to the Bigness you intend the Rocket should be of. Some that are very curious have them made of Brass, and small ones may be made of Ivory. It must be round, and may be quite plain; but some have them ornamented with Mouldings. This may be easily done if they are small enough to be turned in a Lathe.

This Piece of Wood must have a hollow Cylinder bored in it, as you may see in the Figure.

The Diameter of the Bore A B is the Measure of the Mould. Some say the Height of the Bore, or hollow Cylinder, should be seven Diameters; others six, and that great ones should be five, and the very great four.

Those are said to be small ones, whose inward Diameter will not receive more than a leaden Ball of a Pound Weight.

Besides the Mould there must be a Quadra or Foot of the same Materials, which must have a short, solid Cylinder in the Middle to fit the Mould, and on the Top of it must be turned an Hemisphere, or half a Ball. The



Cylinder must be of the Height of one Diameter of the Bore. The Hemisphere, which is at the Top of the afore-said

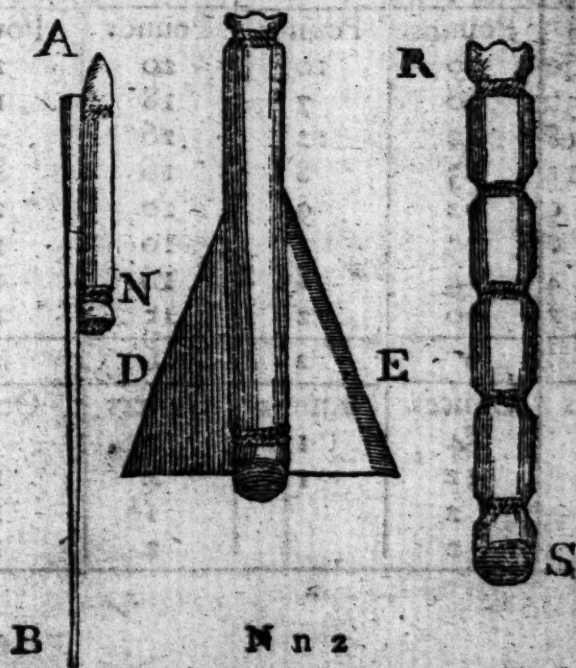
Of ARTIFICIAL FIRE-WORKS. 411

faid solid Cylinder, must be considerably less than the Diameter of the Bore. In this Figure A B C D is the Bore or hollow Cylinder, F is the Hemisphere, F G is the Foot, and H is the Handle of a Screw which serves to keep the Hemisphere steady.

There must be likewise a wooden Cylinder, I K, to roll the Paper upon, whose Diameter must be two Thirds of the Diameter of the Bore, and of the same Length. Thick strong Paper must be rolled very smooth and even, till it is large enough to fill the hollow Cylinder or Bore. This done, where the Haft is joined to the Cylinder, it is to be choked, that is, bound firmly round with Packthread or small Chord, so as to constringe or lessen the Cavity thereof. The Part thus choked or bound up, as at N, is to be equal to the Hemisphere E.

The Case is now to be taken off the Mould, and put into the Cavity of the Frame, and the Choke O must be put upon the Hemisphere, and then it must be filled with a Composition hereafter described, which must be rammed strongly in with a Rammer and Mallet.

When the Rocket is filled, a Paper Cap, of a tapering, conical Form, is to be glued over the End, as at L, and the Space left at the Top is to be filled with whole Gunpowder, to the Height of about one Diameter, and then the Rocket is to be bound or choked at M, as before at N.



Lastly,

412 Of ARTIFICIAL FIRE-WORKS.

Lastly, the Rocket is to bored, as is represented by the prick'd Lines P R, just in the Middle by thrusting a long sharp Spike up the lower Basis, and drawing it out again. It is best done a little before it is used, and should be almost two Thirds of the Length. There must be a Touch-hole at N to set it on Fire.

To make it mount straight up, it must be tied fast to a long slender Stick, marked A B in the foregoing Figure, eight Times as long as the Rocket, and in such a Manner, that when you press it with your Finger near the Touch-hole N, the Stick, which is sloping, and thickest at the upper End, may preponderate a little; then it is to be hung at Freedom, and set on Fire. Some instead of the Stick make it with two Wings, as D E; and some again instead of Paper use a wooden Case, cover'd with Leather; and others again instead of a Stick use an Iron Wire with a Plummet at the End.

The Composition that is made use of to fill Rockets consists of Salt-Petre, Sulphur, and Charcoal, all ground into very fine Powder; but the Proportions are various for Rockets of various Sizes. The following Table will shew the several Proportions at one View.

Weight of Rockets	Salt Petre	Sulphur	Charcoal	Gunpowder finely powd.
Pounds	Pounds	Pounds	Pounds	Pounds,
100 or 60	30	10	20	20
50 30	30	7	18	18
20 18	42	12	26	26
15 12	23	8	16	16
10 9	62	9	20	20
9 6	35	5	10	10
5 4	64	8	16	16
3 2	60	2	15	15
1	6	2	6	32
Ounces	Ounces	Ounces	Ounces	Ounces
9	4	$1\frac{1}{2}$	2	9
6	12	1	4	15
3	2	$1\frac{1}{2}$	$1\frac{1}{2}$	12
1	2	$\frac{1}{2}$	2	15

Rockets

Of ARTIFICIAL FIRE-WORKS. 413

Rockets are now seldom made without Stars, which make a very beautiful Appearance, or with Serpents or Sparks, which take Fire when the Rocket bursts. Sometimes little Rockets are inclosed in great ones, which do not take Fire till they are a great Height.

To make STARS for ROCKETS.

Mix three Pounds of Salt-Petre with 11 Ounces of Sulphur, three Ounces of Gunpowder, and ten Ounces of crude Antimony, all in fine Powder; moisten the Mass with Gum Water, and form them into little Balls of the Size of Filberts; dry them well, When dry inclose a Number of them in the conical Cap of the Rocket.

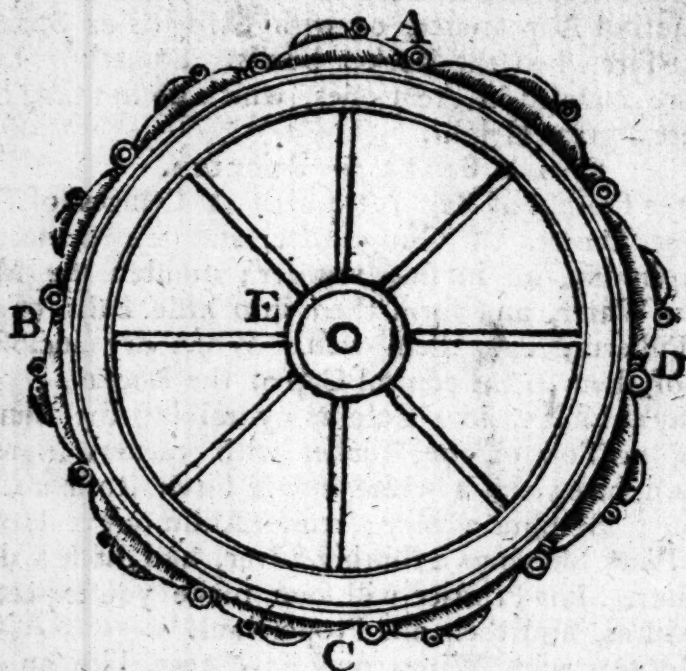
You may exhibit various Colours by mixing the Charge in the Cap or Top of the Rocket with various Ingredients. Camphire yields a white or pale Fire; Rosin a Copper Colour; Sulphur a blue; crude Antimony a Honey Colour; Ivory Shavings a shining Silver, and Pitch a deep dark Colour. But Practice will soon make you expert in these Mixtures, and their due Proportions.

The Rockets with Wings may have two, like an Arrow, expressed in the Figure, or four, like a Dart. They may be made of Paste-board, and glued crossways to the Dart. These Sorts of Rockets are fixed upon a Stand, being placed between four Sticks set upright on the Stand.

Some fire the Matches with Meal Powder, that is, Gunpowder Dust, or ground small, and others with a Match.

WATER ROCKETS differ in nothing from Sky-Rockets, but in the Number of Chokes, which are commonly five, an Example of which you have in the Figure R S. The Diameter of the Bore must be about two or three Inches, and it must be hollowed by a sharp Spike, like the other, two Thirds of its Length. This done, it must be inclosed in a hollow Paper Cylinder smeared with Wax or Pitch, that the Water may not soak through. This Rocket must be so contrived that it may sink in the Water; for this Purpose, some put small Iron Flakes with the Charge at the End. It is made much longer in Proportion than other Rockets. When it is used it may be set on Fire, and flung into the Water.

FIRE-WHEELS are of three Sorts, single, double, and triple. They are generally of a circular Form, as in the Figure in the following Page; but they may be made with Angles, as a Hexagon, Pentagon, Octogon, Decagon,



and the like. The Wheel is turned upon an Iron Pin or Bolt, drove or screwed into a Post. The Nave E is to be turned of close or firm Wood, into which the Spokes are to be fastened, of the same Number as the Fells. These must have a Groove hollowed round, so deep as to contain one half of the Rocket.

The *double Wheels* must have stronger and wider Fells, with a Groove for the Rockets on the Top and one of the Sides. A *triple Wheel* has a Groove at the Top, and one on each Side, and the Matches must be laid from one Groove and Rocket to another, with small Pipes filled with Meal Powder, and after they are fixed you are to cover them with Paper glued over them.

The Rockets being prepared you must cut back the Parts a little shelving, and bore them; the first, three Diameters of its Orifice; the second a little less, and so less and less by Degrees till you come to the last. After this they are to be primed with Meal Powder worked up with Brandy, and glued into the Groove. The Head of the first Rocket must be lifted up higher than the rest, as also that of the last, in which must be a Report. You may also glue small Rockets to the Back of each Rocket, towards the End, as you see in the Figure, and a Communication must be made

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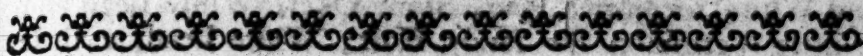
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Of Painting MEZZOTINTO PRINTS 415

made between the Rocket and the Report, by Means of a small Quill. When the whole Preparation is dry, you may cover the Wheel on both Sides with Paper.



Of Painting MEZZOTINTO PRINTS with OIL-COLOURS.

THE Method of colouring Mezzotinto Prints, is first to paste them properly to a Piece of Glass of the same Size, to take off the greatest Part of the Paper, and then to paint with proper Colours. Now to do this, you must first lay the Print in fair Water for two Days and two Nights, or longer, if your Print be on very strong Paper. Then take it out and lay it on two Sheets of Paper, and cover it with two more, and let it lie in that Manner 'till the Moisture is sucked out of the Print. In the mean Time, the Glass the Print is to be laid upon must be set near the Fire to warm; then put some *Straßburgh* Turpentine into a Gallipot, and warm it on the Fire, which done, spread it over the Glass with a Hair-Brush very smooth; then take the Print from between the Sheets of Paper, and lay it on the Glass, beginning at the Top, and so rub it gently down as you go on till it lies close, and there be no Wind-Bladder between the Print and the Glass; this being finished, roll off the Paper with your Fingers till you see nothing but the Print left on the Glass; then set it to dry, and when it is dry, varnish it over with a transparent Varnish, and then it will be fit for Painting.

The Oil-Colours that you make Use of must be ground very fine, and pretty stiff; with these first go over the Master-Lines of the Print with proper Colours, and then those that should appear most forward. When you come to have a compleat Skill in this Method, the Print will look as well as a Painting. But as the Reader may be supposed to be quite ignorant of the proper Colours, I shall give some Directions about them, and then Time and Practice will bring this Art to Perfection.

Colours for Faces. Fair Faces may be coloured with White, a little Vermilion, and a very small Matter of Lake; for the Lips add more Vermilion and Lake; for a brown Face take white and burnt Oker, if middling, mix a little Vermillion with the former; if the Face is designed to

416 *Of Painting MEZZOTINTO PRINTS.*

to represent a Tawny-moor, take *Cullen's Earth* with a little burnt Oker and White.

Colours for the HAIR. Mix Umber with a little Black and White for brown Hair, Stone-Oker, White-Lead and a little Vermilion for sandy Hair; White-Lead, a little Stone-Oker, and a little *Cullen's Earth* for flaxen Hair.

LINEN is painted with White-lead, mixed with a very little Blue.

SILVER is coloured with White, a little Smalt, and some white Masticot.

GOLD is imitated with red Orpiment, and white Masticot, in equal Parts.

Colours for GARMENTS. For *Blue*, take Smalt ground very fine and White-lead; for a *Grass-green*, mix Verdigrease and a little yellow Pink; for a *Willow-green*, mix Verdigrease with a very little White; for a *Sea-green*, mix green Verditer, yellow Pink, and white Lead; a *Carnation* is made by mixing Lake and white Lead; a *Crimson*, by Vermilion, Lake and White; a *Scarlet*, by Vermilion alone; a *Cherry-colour*, by Vermilion and white Lead; a *Yellow* is done by Orpiment or yellow Masticot, if pale mix White with either; an *Orange* is made with Orpiment and Vermilion; a *Purple*, with Smalt, Lake and White; a *Violet*, with Bice and Lake; an *Ash-colour*, with Black and White; a *Chestnut*, with Umber, Lake and White; for a *Dove-colour*, take White, a little Lake and a little Smalt.

Colours for TREES. For the *Bodies of Trees*, take yellow Pink, white Lead, yellow Oker, and a little Black; for the Leaves, take Verdigrease and Pink; for a darker Colour, take Indigo and Pink; for the distant Leaves, take green Verditer, yellow Pink and white Lead.

Colours for the Ground of a Picture. When they are for a Portrait, light Hair requires a dark Ground, that is Umber, White and Black; and dark Hair a light Ground, namely, Umber and White.

Colours for a LANDSKIP. For the Ground take Pink, Oker and White, with a little green Verditer; for Country-Houses at a Distance, take white Lead, yellow Oker and Smalt; as also for Stone-Houses; for the Walls of Brick-Houses at a Distance, take yellow Oker burnt and white Lead; when near, *India Red* and a little White.

SKY-COLOURS are made of Smalt and White; those a little lower should have more White; and those lowest of all, Yellow and Vermilion.

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Of Painting WINDOW-BLINDS.

HERE is a thin Kind of Cloth which will serve best for this Purpose, and may be had at the Linen-Draper's. It must be first wet with clean Water, and then strained tight to the Frames, and when quite dry varnish it with the following Varnish. "Take a Pint of good clear Nut Oil, put it in an earthen Pipkin, and then add half a Pound of Litharge in fine Powder; set it on a slow Fire, and keep it hot for twelve Hours, but it must not boil, stirring it often; then pour off the Oil and put a Pound and a half of the clearest white Rosin therein, and dissolve it in the Oil over a slow Fire, keeping it stirring till it is done; then put in a Pound of Venice Turpentine, and stir them well together." Let the Blinds be varnished over with this Mixture, so as to make them look clear and transparent all over.

When the Varnish is dry, the Blind may be painted with what Figure you like best, though Landships are most agreeable. Colours that have a fine Body are most proper for this Purpose, because they will best transmit the Light.

Lake in this Case, is very suitable for making a Ruby-Red, and distilled Verdigrease serves for a transparent Green. Orpiment yields a Gold Colour, and burnt Umber, as well as yellow Oker, will do well enough when thinly mixed with Oil.

The Varnish above described is of very great Use for Paper Windows, because it renders them transparent and lasting. For those that have weak Eyes it may be mixed with distilled Verdigrease, and then the Paper will become of a fine green Colour, very grateful to the Eyes.



Of Colouring PRINTS, MAPS, PLOTS and CHARTS.

PRINTS, Maps, and Plots of Fields, are stained with Water Colours, which in London may be had ready prepared and put into Shells; but as these are seldom to be had in Country Places, I shall lay down some Instructions how the Colours may severally be fitted for Use,

The Principal are white Lead, Flake-White, yellow and red Oker or Ochre, Umber raw and burnt, Orpiment, Lamp-black, Ivory-black, Vermilion, Gamboge, Lake, Verdigrease, blue and green Verditer, Bice, Bistre, Smalt, Ultramarine.

418 *Of Colouring PRINTS, MAPS, &c.*

• Ultramarine, Carmine, Sap-green, yellow Berries, Brasil-wood, Cochineal, Logwood, and *Spanish Brown*.

Before a Map, Print, &c. is fit for colouring, it should be done over with Alum dissolved in Water, by Means of a large Brush, such as Painters use. But sometimes the Paper is of such a Texture that the Colour will sink in, and then it is impossible to do any Thing neat without preventing this Fault. Some, for this Purpose, smear the Paper over with thin Starch, and let it dry on; but the best Method is to boil Bits of white Leather in fair Water till it is dissolved, and become a thin Size; when the Paper is covered slightly all over with this, and quite dry, it will never deceive your Expectation.

Most of the Colours above-mentioned ground with Water alone would be apt to rub off and so spoil, and therefore it will be necessary to temper them with *Gum-Water*, which is made by dissolving three Ounces of Gum-Arabic in a Pint of soft Water, which must be kept in a Bottle for Use.

Alum-Water is made by dissolving a Quarter of a Pound of Alum in a Quart of Spring-Water over the Fire, and when it is cold it must be put up into a Bottle. It serves to give a Lustre and Beauty to the Colours which are laid on the Paper.

Besides these, you must be furnished with a Piece of Marble or other Stone, and a Muller to grind your Colours with, as well as Pencils of several Sizes, Gally-pots, and Horse-Muscle-Shells to put your Colours when ground and tempered.

To grind a Colour. Take any Quantity of the Colour you think convenient, and lay it on a clean Grinding Stone, then break it small with your Muller, and add a little Water; grind it very fine, and put it into the Shells with a thin Knife. The stiffer they are ground, the better. The Colours to be ground are white Lead, Lake, Indigo, Vermilion, and all earthy Colours.

To wash Colours. Take the Colour and put it into a Bason with fair Water, then stir them well together, and a foul Scum will rise to the Top, which must be taken off; then pour the Water into another Bason, as gently as you can, and pour fresh Water to the remaining Colour; stir them together, and pour off the Water; do this as often as the Colour will render the Water turbid; then the Water poured out must settle, and a fine Colour will remain

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Of Colouring PRINTS, MAPS, &c. 419

at the Bottom. Some Colours, when treated in this Manner, will send off nothing but Filth, and the pure Colour will remain at the Bottom of the first Vessel. This Difference between the Colours will appear at the first Sight. The Colours to be washed are red Lead, Bice, Verditer, *Spanish* Brown and Orpiment. *Note*, True Orpiment is a fine yellow Colour, with the Appearance of Gold Flakes, and is best ground. As for yellow Arsenic, which is a strong Poison, and commonly sold for Orpiment; the best Way is not to use it at all.

Some Colours are to be steeped or dissolved in Water, such as yellow Berries, Gamboge, Saffron, and Sap-Green. *Note*, The best Way of using Gamboge is to take a Lump, and make a Hole at the Top, putting in a little Water, and then, with a Pencil, take off the Colour as you use it.

Some are to be boiled, as *French* Verdigrease, Brasil, Logwood and Wood-foot.

To temper Colours. Put a little Gum-Water into the Shell to your Colour, and stir it about with a clean Finger till it is dissolved.

RED COLOURS, are *Carmine*, which should be tempered with weak Gum-Water, it makes the finest Red; *Vermilion* which is a bright Scarlet; *Lake* is a deep Pink; *Red-Lead* is an Orange; *Brazil* boiled in stale Small-Beer with a little Alum makes a good Red for staining Maps.

YELLOWS. *Gamboge* is a good Yellow, the Manner of using it has been shewn above; *Yellow-Berries* steeped in Water with a little Alum make a bright Yellow to colour Maps; *Orpiment* makes a fine Gold-Colour; *Saffron* steeped in Water makes a fine Gold-Colour, but it soon decays.

BLUES. *Ultramarine* is a very dear Colour, but makes a charming Blue; *Bice* is a very good Blue, but is not transparent; *Indigo* is a very deep Blue, and proper for dark Shades; *Blue Verditer*.

PURPLE. Logwood boiled in the Manner of Brasil makes a very deep Purple.

GREENS. *Sap Green* dissolved in Water with a little Powder of Alum makes a deep Green; *Green Verditer* is a tolerable Green, but not transparent.

BLACKS. *Indian Ink* tempered with Gum-Water makes the best Black; *Lamp-black*, *Printer's-black*, *Ivory-black*.

WHITES. *White-Lead* and *Flake-Whites*. *Note*, All Whites made with Lead will turn black in Time, and therefore

420 *Of Colouring PRINTS, MAPS, &c.*

therefore it will be best to use the white Part of Oyster-shells ground very fine in their room.

BROWNS. *Spanish Brown* burnt makes a redish Brown or Liver-Colour; *Umber* burnt is a Haw-Colour, and proper to shadow Gold; *Wood Soot* is a good Colour for Highways, Lanes, &c.

To make liquid VERDIGREASE. Take two Ounces of good Verdigrease, and Half an Ounce of Cream of Tartar, and of Gum Arabic the Quantity of an Hazle Nut, beat them together to Powder, and boil them together in a Quarter of a Pint of Water till they are dissolved; strain the Mixture through a fine Rag, and keep it in a Bottle for Use. It is of a fine blue-green Colour.

To make BISTRE. Take clean bright Wood-foot, and set it over a slow Fire with Water till it is dissolved; then strain it through a fine Rag, and keep it for Use. If you would have it in a solid Form, evaporate the Water.

To choose PENCILS. When you buy Pencils see that they are full, and that they gradually lessen to a Point, which you may tell by putting the Pencil in your Mouth and drawing it through your Lips once or twice, and then you will see its true Shape. When they do not end even, or when they are ragged at the Point, they are not good.

When you make use of a Pencil, and have laid on one Colour, before you lay on another cleanse it well in a Dish of Water, which must always stand by you while you are at work.

To colour PRINTS. When these are Mezzotinto Portraits, the best way will be to get a good Picture of a Man or Woman that is well painted, and as near as you can imitate the Colours laid on different Parts of the Face, Hands and Drapery, till you can proceed without a Guide. Prints of Landskips, Views of Towns, and the like, should be first attempted by good Patterns laid before you done by a good Hand; but if these are not to be had, take a good painted Picture, the likest the Print you can get, and observe how the Sky, Clouds, Hills, Houses, Fields, Trees, Grass, Ground, Cattle, Sheep and other Things are coloured therein, which if well copied, will soon bring you to give every Part its proper Tint, remembering always to represent the Light and Shades; for this will give Life and Beauty to the whole Performance.

To colour the PLOT laid down from a Survey. In this Case, suppose you were to inclose a Field with Yellow, make

To colour MAPS. What has been said about colouring of Plots may safely be applied to the colouring of Maps, only instead of a black Line there are Lines of Dots or Points, which divide one Country from another Follow these as a Guide, and lay on the Colour as above directed. In general Maps, as of *Europe*, for Instance, *France* must be done with one Colour, *Italy* with another, &c. In Maps of *England*, *Essex* must be bounded with one Colour, *Middlesex* with another, *Surry* with another, *Hertfordshire* with another, &c. It is common to stain the whole Map with different Colours, and then the Bounds or Edge of each Country or County must be somewhat more strong coloured than the Middle, taking Care that this last be quite transparent, that every Letter may be plainly seen through the Colour. County Maps are divided into Hundreds, which are to be distinguished by different Colours, in the same Manner as whole Countries.



THE Colours that are made to colour Timber, or any Thing that is exposed to the Weather, must have a Body, and therefore many Colours are to be rejected which were useful on other Occasions. And therefore to prevent Mistake, I shall enumerate the Colours that are proper for this Purpose.

The *Whites* are white Lead and Cerufs, which last is only more clear and pure than the former: These may be worked with much Ease, and will grind as fine as the Oil itself; for in-door Work grind it with Nut-Oil, and for Work without Doors with Linseed Oil, because Nut-Oil will not be so apt to turn yellow.

The most common Black is *Lamp-Black*, which should be mix'd up with drying Oil, otherwise it will continue wet a long Time, because it is greasy. But this may, in some Measure, be remedied by heating a Shovel red hot, and laying it thereon till it has done smoaking. *Ivory-Black* may be had at the Colour Shops, ready prepared. It will grind well with Oil, and will lie on your Work with a good Body.

Vermilion is a beautiful Red, and may be ground with Oil very fine. It has a good Body, and will spread very freely. Some make use of *Lake*, which is a purplish Red, but then it must only be for in-door Work. *Red Lead* is a Kind of an Orange-Colour, and has a good Body, binding very fast, and drying quickly. *Spanish Brown* is of the Colour of Horse-Bleth, and is of great use for priming any Work, being cheap and will grind fine.

Yellow Oker is of several Sorts, that is, some of a lighter and some of a deeper Yellow. It has a very good Body, and resists the Weather to Admiration. *Pink Yellow* has a green Cast, and is very proper for Work within-doors. *Orpiment*, not yellow Arsenick, is very proper for the same Use. *Masticot* is a light Yellow, and makes a good Green mix'd with a Blue.

Verdigrease is a very useful Colour, and is of a blueish Green, and if you mix it with yellow Pink it makes a fine Grass-Green. *Green Bice* is gritty, as well as *Green Verditer*, and yet neither of them have Body enough for this Kind of Painting, but yet are very proper for Pictures.

Blue Bice is of a pale Blue, and is useful enough, but is hard to grind fine. *Prussian Blue* would be an excellent Colour if it would but stand, for though it looks very fine at first, it is apt to change to a dark dirty Colour. *Indigo* is a very dark Blue, and therefore it is usually made lighter with a Mixture of White, and then it has a faintish Appearance. However it has a good Body, and is much used in this Sort of Painting. *Smalt* is a charming Blue, but loses its Beauty when mix'd with Oil, and therefore it is to be strewed on the Work first painted with white Lead.

Umber is a Sort of a brown or hair Colour, and grinds very fine, bearing an excellent Body. If you put a Lump in the Fire, making it red hot, it will become darker, and at the same Time more lively.

For grinding Colours it will be necessary to have a Piece of Marble or other Stone to grind them upon, which may be

be had at the Colour Shops from two Shillings to a Crown a Piece. As also a Muller to grind them with. The Price is eighteen Pence, or two Shillings.

To lay on the Colours you must have Brushes, which may be had from a Penny to Six-pence a piece. For some Sort of fine Works you must have Pencils in Tin Cases, or Wood Sockets, which will cost from two Pence to eight Pence a piece. Swan-Quill Pencils are a Penny a piece. Duck-Quills are Six-pence a Dozen one with another.

When Colours are only mix'd with plain Linseed Oil; they commonly are a long while in drying, and therefore it will be proper to mix them with *drying Oil*, which is made in the following Manner. Take a Quart of Linseed Oil, and two Ounces of Litharge in fine Powder. Mix them and set them over the Fire in an earthen Pan, and let them boil for near an Hour, or till the Oil is grown thick and fat; then take off the Pan, and when the Litharge is settled to the Bottom, pour it into a Bladder or Glass Bottle, and keep it for Use. When you mix your Colours, take three Parts of Linseed Oil and one of drying Oil.

For coarse out-side Work, that requires a great deal of Colour, it is always put into Pots, and taken from thence with a Brush at the Time of Use, and when it is set by, there should be Water poured on the Top to preserve the Colour from drying. Likewise the Colour should be washed out of the Tool or Brushes, first with Linseed Oil and then with Sope-Suds.

When you have Occasion to paint or draw any Thing with small Pencils, your Colours should be laid on a Pallet by the Side of each other. In this Case likewise it will be best to buy the Colours ready prepared, which may be had at the Colour Shops at easy Rates, put up in small Bladders; and when you use them you must prick the Bladders, and squeeze out as much of each Colour on the Pallet as you think you shall want. This is the Method that Land-skip and Portrait Painters use. By mixing the Colours thus laid, you make any Shade that will be wanted.

It will be necessary to know *what Colours will arise from the Mixture of others* in common Painting. Thus white Lead and Lamp-Black mix'd together make an Ash-Colour; Indigo and White make a Lead-Colour; White and Oker make the Colour of new Timber; white Lead, Vermilion and Lake make a Flesh-Colour; yellow Oker and white Lead

Lead make a Buff-Colour; Verdigrease and White make a light Willow-Green; Verdigrease and yellow Pink make a Grass-Green; Lake and White make a Carnation; yellow Oker and Red-Lead make an Orange; Red-Lead, yellow Oker and a little White make a Brick Colour; yellow Oker and White make a Straw-Colour; burnt Umber and White make a Walnut-Tree Colour, &c. Use and Experience will show you the Result of many other Mixtures.

The Design of common Painting is to preserve Wood and Iron from the Weather, in performing of which you must first look over your Work, and see if there is any open Joints or Clefts in the Wood, and if there are they must be first stopped with Putty made with Whiting and Linseed Oil, otherwise the Wood will soon be decay'd by the soaking in of the Wet. Then proceed to priming the Work with *Spanish Brown* mix'd with Plenty of Oil, that it may the better penetrate every Part of the Work. Repeat this a second and a third Time with the same Colour of a thicker Consistence, if you would have the Work durable and lasting. This being dry lay over the Colour you design it to be of as thick as you can well work it, taking Care that no Part is missed.

The Marbling of Chimney-Pieces, and the Painting Wainscot like Walnut-Tree or Mahogany, is best attained by observing the Method that other Painters take when they are at Work. And indeed in all other Kinds of Painting it will be a great Advantage, if you have an Opportunity of seeing all the Management from the grinding of the Colours to the laying them on, and then the Rules that I have laid down will be of a more singular Advantage in forming your Judgment.



FORMS for BUSINESS in the MERCANTILE WAY.

Bills of Parcels.

London, June 20, 1759.

The Honourable Mrs. Williams, Bought of Thomas Groves,
 20 Yards of flower'd Damask, at 7s. 6d. 7 10 0
 32 Yards ditto, 8s. 12 16 0
 10 Yards of rich Sattin, 15s. 7 10 0
 12 Yards of Paduasoy, 11s. 6d. 6 18 0

£ 34 14 0

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Forms for Mercantile Business. 425

London, June 22, 1759.

Mess. <i>Wilson</i> and <i>Darwes</i> ,		Bought of <i>Franklin</i> and <i>Long</i> ,	
No. 1	6 Pieces of Dowlas,	at 28s. 6d.	8 11 0
2	4 Ditto,	29s. 6d.	5 18 0
3	6 Ditto,	30s. 6d.	9 3 0
10	Pieces of Cambrick,	35s.	17 10 0
	6 Doz. Linen Handkerchiefs,	15s. 6d.	4 13 0

£ 45 15 0

Invoice from ITALY.

Factory of the Cost and Charges of one hundred Barrels of Anchovies shipped on board the *Turtle*, Capt. *William Gee*, for Account of Mr. *Theophilus Ducarcy*, of London, Merchant, and consign'd to himself under Mark per Margin.

To prime Cost of said 100 Barrels of Anchovies, at Ps. $\frac{8}{8}$ per Bar. $2\frac{3}{4}$ } 1650 0 0

To Portorage and Ware-

house, Liv. 6 0 0

T To Jessing, with Cooper's Pains, 15 0 0

To Warehouse Room and Leviation, 25 0 0

To Portorage and Boatage aboard, 20 0 0

To Brokerage, $\frac{1}{2}$ per Cent. 8 5 0

To Primage, 5 0 0

79 5 0

To my Provision, 3 per Cent.

51 17 6

Leghorn, June 18, 1758.

Errors excepted.

Joseph Lawrence.

Bills on Book Debts.

1759	Mess. <i>Darwes</i> and <i>Jones</i> ,	Dr. to <i>James Longman</i> ,
April 21	—To 50 Yards Paduasoy, at 15s.	37 10 0
	22 Yards $\frac{3}{4}$ Lutestring, 8s. 6d.	9 7 0
May 3	—To 40 Yards silk Camblet, 3s. 6d.	7 0 0
	20 Yards Grogam, 3s.	3 0 0
June 12	—To 36 Yards Mantua, 3s. 6d.	6 6 0
	16—To 24 Yards flower'd Damask, 8s.	9 12 0

£ 72 15 0

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Richard

426 *Forms for Mercantile Business,*

Richard Thompson, Esq;

		<i>Dr. to Philip Overbury.</i>	
1759			
March 26	To 20 Gallons Palm Sack, at 10s.	10	0 0
April 10	To 30 ditto Red Port,	6s.	9 0 0
May 6	To 17 ditto Lisbon,	6s. 8d.	5 13 4
	15 To 12 ditto Rhenish	7s.	4 4 0
June 8	To ½ Chest of Florence,		2 5 0
July 2	To 3 Dozen Claret,	52s.	7 16 0
1759			38 18 4
May 20	By your Bill on <i>Davis</i> and <i>Long</i> received	18	10 0
Balance due		£	20 8 4

*Various Forms of Acquittances, upon the Receipt of Money,
by Masters, Servants, Agents, &c.*

R Eceived *May 13, 1754,* of *Mr. John Williams,* nine Pounds ten Shillings, for my Master *William Hunt.*
£9 10 0 per *John Cole.*

Received the 24th of *June, 1754,* of *Henry Poewel,* forty-five Pounds eight Shillings, in full for my Master, *William Savil.*

£45 8 0 per *James Smart.*

Received the 24th of *May, 1755,* of the Honourable *East-India Company,* by the Hands of *William Hall, Esq;* two thousand Pounds, for *Mr. Phipps* and Company.

£2000 0 0 per *Thomas Trust.*

Received the 29th of *August, 1754,* of *Mess. John* and *James Sterling,* five hundred and forty-five Pounds, on Account.
per *William Day.*

Received the 20th of *April, 1725,* of *Jeremiah Watson, Esq;* the Sum of two hundred and fifty Pounds, in full of all Demands, for Self and Company.

£250 0 0 per *Jonathan Scot.*

Received the 20th of *May, 1755,* of *Mr. Charles Thorne,* twenty-five Pounds, in full for the Difference of two thousand five hundred Pounds, Bank Stock.

£25 0 0 per *John Trier.*

Received the 19th of *June, 1755,* of *Mr. James Stone,* thirty-six Pounds, in full for six Months Interest of thirteen hundred and twenty Pounds, due at *Lady-Day* last.

£36 0 0 per *Henry Slater.*

Received

Forms for Mercantile Business.

427

Received the 30th of July, 1755, by the Order and for the Use of Mr. Henry March, of Mr. Stephen Lowell, eight Pounds ten Shillings, and allowed for Taxes and Repairs one Pound ten, making together the Sum of ten Pounds, in full for a Quarter's Rent, due at Michaelmas last.

£ 10 0 0

per Randal Stone.

Received the 2d of August, 1755, of the Executors of James, late Earl of Gower, by the Hands of Mr. William Gee, the Sum of seventy five Pounds, in full for my half Year's Annuity, due at Lady Day last.

£ 75 0 0

per Jane Sharro.

Various Forms of Promissary Notes.

London, July 6, 1759.

I promise to pay the Honourable Savage Parrel, Esq; or Bearer, on Demand, fifty Pounds,

£ 50

For Sir Edward Penrith and Partners,
Edmund Stokes.

I promise to pay Mr. John Edwards, or Bearer, on Demand, eight hundred Pounds, August 10, 1751.

£ 800

Henry Steele.

I promise to pay to the Governor and Company of the Bank of England, nine thousand eighty Pounds,

For Self and Partners, June 19, 1751.

£ 9080

Francis Fane.

I promise to pay Henry Petersham, Esq; Cashire of his Majesty's Revenue of Excise, or Order, forty Days after Date, four hundred and fifty-five Pounds, value received.

£ 455

per William Ettrington.

I promise to pay Sir Josiah Todd, or order, the sum of sixty Pounds in manner following, twenty pounds part thereof three Months after date, twenty Pounds more the 25th of April next, and the remaining twenty Pounds the 25th of June next following, the Value received. Witness my Hand, at London, the 25th of October, 1751.

£ 60 0 0

Edward Doughty.

Stratford, June 11, 1749. £ 105.

Borrowed and received of Mr. John Friend the Sum of one hundred and five Pounds Sterling, which I promise to pay the said John Friend, or Order, upon Demand:

Witness my Hand,

Abraham Needful.

Witness } James Long,
 } John Stacy.

Re-

Received of *T. F. Esq;* eight Deeds, all relating to his Estate in the Parish of *Ongar*, in *Essex*; which I promise to return the said *T. F.* or Order, undamaged, on Demand. Witness my Hand, this 24th Day of *May*, 1755.

Peter Grew.

Inland BILLS of EXCHANGE.

London, July 3, 1754.

S I R,

£ 27 17 0

At six Days Sight pay Mr. *John Long*, or Order, twenty-seven Pounds seventeen Shillings, value received of Mr. *Thomas Wilcox*, and place it to Account without further Advice from

To Mr. *Samuel Johnston*,
Linen-draper in *Worcester*,

Your very humble Servant,
Thomas Young,

Exeter, July 4, 1754,

£ 4350 0 0

Mess. *Tanter and Cooper*,

At twenty Days Sight, pay Mr. *Richard Jones* four thousand three hundred and fifty Pounds, value of him received, and place it to Account, as by Advice from

To Mess. *Tanter and Cooper*,
Bankers in *London*.

Your very humble Servant,
David Williams.

London, July 5, 1754.

£ 250 0 0

S I R,

Fifteen Days after Date pay *Samuel Lowe, Esq;* or Order, two hundred and fifty Pounds, value received of Mr. *Jacob Wilson*, and place it to Account, as by Advice from

To Mr. *Timothy Wilkes*,
Merchant in *Lincoln*.

Your very humble Servant,
Jacob Lovett.

Bristol, July 4, 1754.

£ 50 3 0

S I R,

One Month after Date, pay Mr. *Thomas Cape*, or Order, fifty Pounds three Shillings, value received, and place it to Account, as per Advice from

To *Joseph Swift*,
Merchant in *Winchester*.

Your very humble Servant,
Edward Leach.

Foreign BILLS of EXCHANGE.

Rotterdam, July 22, 1759.

For *£ 60 Sterling.*

Due 11 Sept.

At two Usance of this my first of Exchange, pay to Mr. *Jean Pierre St. Martin*, or Order, sixty Pounds Sterling, value of Mr. *Jean Burger*.

Accept. *J. T.*

To Mr. *Richard Longman*,

Claudius Vanhagen.
Merchant in *London.*

Res-

Forms for Mercantile Business. 429

Rotterdam, July 22, N. S. 1759.

For £ 60 Sterling.

At two Usance of this my second of *Exchange*, (the first not paid) pay to Mr. *Jean Pierre St. Martin* or Order, sixty Pounds Sterling, Value of Mr. *Jean Burgher*.

To Mr. *Richard Longman*,
Merchant, in *London*,

Claudius Venbagen.

London, August 8, 1754.

Crowns 876, at 34 d. per Crown.

At six Days sight, pay this my second of *Exchange*, (the first not paid) to Mr. *James Jardin*, or Order, eight hundred seventy-six Crowns *Tournois*, at sixty So's *Tournois* the Crown, value received, at thirty-four Pence Sterling the Crown, as advised by

To Mess. *Freeman and La Mort*,
Merchants in *Paris*.

Clement Goddard.

Genoa July 9, 1754.

For 650 Crowns, at 65 d. Sterling.

At ten days Sight, pay this my second of *Exchange*, (the first not paid) to Signior *Francisco Denomo*, or Order, six hundred and fifty Crowns, *Exchange* at sixty-five Pence per Crown, value received of himself, and place it to Account, as advised by

To Mess. *Jackson and French*,
Bankers in *London*.

John Gerrard Gordon.

As foreign Bills of *Exchange* are often drawn at *Usance*, double *Usance*, *Usance* and a half, or *Usance* and so many Days, it will not be improper to inform the young Trader what *Usance* is, and how it is reckoned, in the several Parts of *Europe*.

Usance, therefore is a customary Time for the Payment of Foreign Bills of *Exchange*, passing from one Nation to another. The *Usance* of *London*, to and from *France*, *Amsterdam*, *Rotterdam*, *Antwerp*, *Hamburg*, *Brabant*, *Zealand* and *Flanders*, is one Calendar Month; and the double *Usance* two Calendar Months. But the *Usance* of *London* to and from *Spain* or *Portugal*, is two Calendar Months, and double *Usance* four Months. The *Usance* of *London*, to and from *Italy*, is three Months, and double six Months.

If an accepted Bill be put off, when due, it must be noted, that is, put into the Hands of a Notary Public, who will carry or send it to the Person upon whom it is drawn, and upon Refusal of Payment, upon any Pretence whatsoever, he will protest it. If

If a Bill be protested for Non-payment, you must send the Bill and Protest to the Person you received it of, who must forward the same till it comes to the Drawer, in order to recover all Costs, Charges, and Interests from him; or if he fails, from any of the Indorsers, if protested in due time.

Though a Bill of Exchange be made payable to a particular Person, without mentioning the Word Order, such Bill may notwithstanding be indorsed, and if accepted, the Person who has accepted it, will be oblig'd to pay it, when due, to the Person to whom the same is indorsed.



FORMS in LAW of general Use.

A Bond to which any Condition may be placed.

K NOW all Men by these Presents, that I (*Richard Thompson*, of *Brentford* in the County of *Middlesex*, Grocer) am held and firmly bound to (*William Long*, of *Richmond*, in the County of *Surry*, Gent.) in one hundred and sixty Pounds lawful Money of *Great Britain*, to be paid to the said (*William Long*) his certain Attorney, Executors and Administrators, for the Payment whereof I bind myself, my Heirs, Executors and Administrators, firmly by these Presents, sealed with my Seal, dated this twenty-fourth Day of *January*, in the twenty-seventh Year of the Reign of our Sovereign Lord *George* the Second) by the Grace of God of *Great-Britain*, *France* and *Ireland*, King, Defender of the Faith, and so-forth, and in the Year of our Lord (one thousand seven hundred and fifty-nine.)

The Condition.

The Condition of this Obligation is such, that if the above-bounden (*Richard Thompson*) his Heirs, Executors, or Administrators, do well and truly pay or cause to be paid unto the above-mentioned (*William Long*) his Executors, Administrators, or Assigns, the full Sum of (eighty Pounds) of good and lawful Money of *Great Britain*, on the (twenty-second Day of *December*) next ensuing the Date hereof, with lawful Interest for the same, then this Obligation to be void, or else to remain in full force.

Sealed and delivered being
first legally stamped, in
the Presence of C. D.

Richard Thomson, S. P.

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Note, When a Bond or Condition is given in Consideration of the Value received, the Obligation is always to be made for double the Value in the Condition.

his, or the following Precedents, may be made agreeable to any Circumstances only changing as Occasion shall require, what is inserted between ()

The Date of all legal Instruments, Sums of Money, and the number of all other Things specified, must be written in Words at length, and in *English*, according to a late Act of Parliament.

In this Precedent, S. P stands for Seal's Place, or the Place, where the Seal is to be affixed.

The Condition of a Bond given to stand to the Award of Arbitrators.

THE Condition of this Obligation is such, that if above-bouden (*Charles Clinton* of the City of *London*, Gent.) his Heirs, Executors and Administrators, and every of them, do and shall in all Things well and truly stand to, obey, and abide by, perform, fulfil and keep the Award, Order, Arbitrament, final End and Determination of (*Richard Moor* and *Edward Elms* of *London*, Merchants) Arbitrators indifferently named, elected and chosen, as well on the Part and Behalf of the above-bouden (*Charles Clinton*) as of the above-named (*Francis Cox*) to arbitrate, award, order, judge, and determine of and concerning all manner of Action and Actions, Cause and Causes of Action and Actions, Suits, Bills, Bonds, Specialities, Judgments, Executions, Extents, Accounts, Debts, Dues, Sum and Sums of Money, Controversies, Trespases, Damages, and Demands whatsoever, at any Time or Times heretofore had, made, moved, brought, commenced, sued, prosecuted, done, suffered, committed, and depending by, or between the said Parties; so as the Award be made and given up in Writing, under their Hands and Seals, ready to be delivered to the said Parties, on or before (the first Day of *November* next ensuing the Date hereof) but if the said Arbitrators do not make such their Award of, and concerning the Premises by the Time aforesaid, that then if the said (*Charles Clinton*) his Heirs, Executors, and Administrators, for his and their Parts and Behalf, do in all Things well and truly stand to, obey, abide, perform, fulfil, and keep the Award, Order, Arbitrament, Umpirage, final End and Determination of (*George Grub* of *London*, Merchant) Umpire

Note,

pire indifferently chosen between the said Parties, to end the said Matter and Differences, so as the said Umpire do make his Award or Umpirage of, and concerning the Premises, and deliver the same in Writing, under his Hand and Seal, to the said Parties, on or before the (sixth Day of *November*) next ensuing the Date hereof, then this Obligation to be void, or else to remain in full Force.

Sealed and Delivered, being
first legally Stamped, in
the Presence of, &c.

Charles Clinton, S. P.

Note, In such Cases both Parties are mutually bound, and if an Umpire be not admitted the latter Part of the Condition beginning (but if the said Arbitrators) is to be omitted in this Instrument. But there should be added a Clause, signed and sealed by each Party, directing such Award to be entered and given as a Plea in either of the King's Courts at *Westminster*, in order to corroborate and render it final.

A General Release.

K NOW all Men by these Presents, that I (*Charles Low,* of *Kensington*, in the County of *Middlesex*, Grocer,) have remised, released, and for ever quitted Claim; and by these Presents do for myself, my Heirs, Executors, and Administrators, remise, release, and for ever quit Claim, unto (*Thomas Long*, of *Kingston*, in the County of *Surry*, Innholder,) his Heirs, Executors, and Administrators, all and all Manner of Actions, Cause and Causes of Actions, Suits, Bills, Bonds, Writings, obligatory Debts, Dues, Duties, Accounts, Sum and Sums of Money, Judgments, Executions, Extents, Quarrels, Controversies, Trespasses, Damages and Demands whatsoever, both in Law and Equity, or otherwise howsoever, which against the said (*Thomas Long*) I ever had, now have, and which I, my Heirs, Executors, and Administrators, shall, or may have, Claim, Challenge, or Demand, for or by Reason or Means of any Matter, Cause or Thing, from the Beginning of the World to the Day of the Date of these Presents. In Witness whereof I have hereunto set my Hand and Seal, the (twelfth Day of *December*,) in the Year of our Lord (one thousand seven hundred and fifty.)

Signed, sealed, and delivered,
being first legally Stamp'd,
in the Presence of,

Charles Low, S. P.

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The Form of an Umpirage of Award.

TO all People to whom this present Writing shall come, I (*George Grubb*, of *London*, Merchant) Umpire, indifferently chosen between (*Charles Clinton*, and *Francis Fox*, of *London*, Merchants and Gentlemen) send Greeting. Now know ye that I, the said (*George Grubb*) having deliberately heard, considered, and understood the Grievs, Allegations, and Proofs of both the said Parties, and being willing, as much as in me lies, to set the said Parties at Unity and good Accord, do by these Presents arbitrate, award, order, deem, decree, and judge that the said (*Charles Clinton*) his Executors, Administrators, or Assigns, do and shall well and truly pay, or cause to be paid, unto the said (*Francis Fox*) his Executors, Administrators, or Assigns, the full Sum of (eighty Pounds) of lawful Money of *Great-Britain*, on the (Thirtieth of *December*) next ensuing the Date of these Presents; and that upon Payment thereof, the said (*Charles Clinton*) and (*Francis Fox*) shall at their own proper Costs and Charges, seal, subscribe, and as their several Acts and Deeds deliver each to the other a general Release in Writing, of all Matters, Actions, Suits, Causes of Actions, Bonds, Bills, Covenants, Controversies, and Demands whatsoever, from the Beginning of the World to the (first Day of *May* last past) and in the (twenty-fourth Year of the Reign of our Sovereign Lord *George* the Second, King of *Great-Britain*, and so forth. In Witness whereof, I have hereunto set my Hand and Seal, (this twenty-sixth Day of *June*) in the Year of our Lord, (one Thousand seven Hundred and fifty-nine.

Sealed and delivered, being
first duly stamp'd, in the
Presence of, &c.

George Grubb, (S. P.)

A Letter of Licence.

TO all People to whom this present Writing shall come, we whose Names are hereunto subscribed, and Seals affixed, Creditors of (*Charles Brown*) of *London*, Merchant) send Greeting. Whereas the said (*Charles Brown*) on the Day of the Date of these Presents is indebted to us severally, in divers considerable Sums of

P p

Money,

Money, which at present he is not able to satisfy unto us, without Respite and Time to him given for the Payment thereof. Know ye therefore that we the said Creditors, for divers good Causes and Considerations us thereunto moving, have given and granted, and by these Presents do give and grant unto the said (*Charles Brown*) our sure and safe Conduct and free Licence, that he the said (*Charles Brown*) shall and may safely come and go, and resort unto us, and every one of us his said Creditors, to compound and take Order with us and every one of us, for all and every one of our said Debts, and to go about every other Business to any Person or Persons whatsoever, without any Trouble, Suit, Arrest, Attachment, or other Molestation to be offered or done unto him the said (*Charles Brown*) his Wares, Goods, Monies, or other Merchandize whatsoever, by us, or any of us, or by the Heirs, Executors, Administrators, Partners, or Assigns of us or any of us, or by our, or by any of our Means and Procuréments, to be sought or procured to be done from the Day of the Date hereof, unto the full End and Term of (one whole Year) next ensuing. And we the said Creditors, whose Names are here-under written, do hereby covenant and agree, and every one of us for his own Part, his Executors and Administrators, covenanteth and granteth to and with the said (*Charles Brown*) that if any Trouble, Wrong, Damage or Injury shall be done unto him the said (*Charles Brown*) either in Body, Goods or Chattles, or any of them, within the said Term of (one Year) next ensuing the Date hereof, by us or any of us his said Creditors, or by any other Person or Persons, by or through the Procuréments, Consent or Knowledge of us, or any of us, contrary to the true Intent and Meaning of this our present Writing of safe Conduct, that then the said (*Charles Brown*) by Virtue of these Presents, shall be discharged and acquitted for ever towards and against him and them, of us, his and their Heirs, Executors, Administrators, Partners or Assigns, and every one of them by whom and by whose Means he shall be arrested, troubled, and attached, or indemnified of all Manner of Actions, Suits, Quarrels, Debts and Demands, either in Law or Equity, from the Beginning of the World to the Day of the Date hereof. In Witness whereof we have hereunto set our Hands and Seals, this

this (fourth Day of *December*) in the Year of our Lord
(one Thousand seven Hundred and fifty-nine).

Signed, sealed and delivered, *A. B. S. P. N. O. S. P.*
being first duly stamp'd, *C. D. S. P. P. Q. S. P.*
in the Presence of, *E. F. S. P. R. S. S. P.*
A. Z. G. H. S. P. T. U. S. P.
B. Y. I. K. S. P. W. X. S. P.
L. M. S. P. Y. Z. S. P.

Form of a W I L L.

In the Name of God. Amen.

I (The Lady *Charlotte Careful*, of *Chiswick*, in the
County of *Middlesex*, Widow) being of perfect Mind
and Memory, make this my last Will and Testament.
First, I desire to be decently buried in the Parish Church
of *Chiswick* aforesaid, and I Will that the Charges of
my Funeral may not exceed sixty Pounds. My Estate and
Effects I bequeath and dispose of in Manner and Form
following.

First, To my Daughter, *Charlotte*, I give and bequeath
the Sum of five thousand Pounds, my *Indian Cabinet*, to-
gether with whatsoever shall be therein at the Time of my
Decease, my Table-Clock and Watch, and my Picture
drawn by *Kneller*.

Also, to my Niece, *Elizabeth Jones*, I give and bequeath
the Sum of two hundred Pounds, my Diamond Rings,
Solitaire, Pearls, Pendants, set Diamonds, and a mourn-
ing Ring.

Also, to *Abraham Algett*, my Servant, I give the Sum of
fifty Pounds.

And to the Poor of the Parish in which I shall or may
reside at the Time of my Decease, I give and bequeath the
Sum of forty Pounds, to be paid within three Weeks after
my Interment, into the Hands of the Minister and Church-
Wardens, to be by them distributed to such as they shall
think proper Objects of Charity.

The Residue and Remainder of my Estate, Lands, Te-
nements, Hereditaments, with my Goods, Plate, Jewels,
India Bonds, Arrears of Rent, with all other Properties
whatsoever to me appertaining, I give, devise and bequeath
to my Son, the Right Honourable *Thomas*, Lord Viscount
Careful, whom I do hereby constitute and appoint the
whole and sole Executor of this my last Will and Testa-

ment; and I do hereby utterly revoke, disallow and disannul all former Bequests, Wills and Legacies, by me heretofore in any wise left or made, declaring, ratifying and confirming this, and no other, to be my last Will and Testament. In Witness whereof, I have hereunto set my Hand and Seal, this twentieth Day of *October*, in the Year of our Lord one Thousand seven Hundred and fifty-nine.

Charlotte Careful, S. P.

Signed, sealed, published and declared by the within-named Testatrix, the Lady *Charlotte Careful*, to be her last Will and Testament, in the Presence of us, who subscribed our Names in the Presence of the said Testatrix.

E. F.

G. H.

I. K.

Note, Where a real Estate is concerned, three Witnesses are absolutely necessary, which Witnesses should see each other sign the Will, as well as see the Testator sign it; but where it is a personal Estate only, two only may do. The Law excepts Wills from the Duties of the Stamp-Office.



The Use of the following TABLES of INTEREST.

R U L E.

LOOK for the Number of Months, on the Top of the Table, and for the Rate *per Cent.* on the Top of the Column, and for the Number of Pounds employed, in the first Column, and in the common Angle of Meeting, is the Answer to the Question.

E X A M P L E.

What is the Interest of 50*l.* for three Months, at 6 *per Cent.*?

The Interest of 50*l.* at 6 *per Cent.* for three Months, is 15*s.* 0*d.*

To cast up any Rate of Interest, not expressed in the following Tables.

R U L E.

Look into the Tables for two or more such Rates whose Sum is equal to the Rate required; and the Sum of the Interest of such Rates for the given Principle and Time, is the Interest sought.

E X A M-

EXAMPLE.

What is the Interest of 50*l.* for 6 Months, at 8 per Cent.
 The Interest of 50*l.* for 3 Months, at 5 per Cent. is 12*s.* 6*d.*
 The Interest of 50*l.* for 3 Months, at 3 per Cent. is 7 6
 Their Sum is the Interest required, *l.* 1 0 0
 The like to be understood of any other Rate of Interest.

For One Month.

L.	at 2 per cent.		2½ per cent.		3 per cent.		3½ per cent.		4 per cent.		4½ per cent.		5 per cent.		6 per cent.	
	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>	<i>l.</i>	<i>s.</i>
10	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
20	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0
30	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0
40	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0
50	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
60	6	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0
70	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0
80	8	0	8	0	8	0	8	0	8	0	8	0	8	0	8	0
90	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0
100	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0
200	20	0	20	0	20	0	20	0	20	0	20	0	20	0	20	0
300	30	0	30	0	30	0	30	0	30	0	30	0	30	0	30	0
400	40	0	40	0	40	0	40	0	40	0	40	0	40	0	40	0
500	50	0	50	0	50	0	50	0	50	0	50	0	50	0	50	0
1000	100	0	100	0	100	0	100	0	100	0	100	0	100	0	100	0

For Three Months.

L. at	2 per cent.				2½ per cent.				3 per cent.				3½ per cent.				4 per cent.				4½ per cent.				5 per cent.				6 per cent.			
	l.	s.	d.	f.	l.	s.	d.	f.	l.	s.	d.	f.	l.	s.	d.	f.	l.	s.	d.	f.	l.	s.	d.	f.	l.	s.	d.	f.				
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
3000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
10000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					

For

For Six Months.

For Six Months.

L. at	2 per cent.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.	
l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.
1	0 0 2 1	0 0 3 2	0 0 4 0	0 0 5 1	0 0 6 3	0 0 7 5	0 0 8 10	0 0 9 7	
2	0 0 4 3	0 0 6 7	0 0 8 1	0 0 10 3	0 0 12 9	0 0 15 1	0 0 17 10	0 0 19 2	
3	0 0 6 7	0 0 9 0	0 0 10 3	0 0 12 9	0 0 15 1	0 0 17 10	0 0 19 2	0 0 21 4	
4	0 0 9 2	0 0 11 6	0 0 13 8	0 0 16 0	0 0 18 6	0 0 21 4	0 0 24 0	0 0 26 8	
5	0 0 1 0 0	0 0 13 6	0 0 16 0	0 0 18 6	0 0 21 4	0 0 24 0	0 0 26 8	0 0 29 6	
6	0 0 1 2 1	0 0 15 9	0 0 18 6	0 0 21 4	0 0 24 0	0 0 26 8	0 0 29 6	0 0 32 4	
7	0 0 1 4 3	0 0 18 2	0 0 21 4	0 0 24 0	0 0 26 8	0 0 29 6	0 0 32 4	0 0 35 2	
8	0 0 1 7 0	0 0 20 5	0 0 23 7	0 0 26 8	0 0 29 6	0 0 32 4	0 0 35 2	0 0 38 0	
9	0 0 1 9 2	0 0 22 8	0 0 26 0	0 0 29 6	0 0 32 4	0 0 35 2	0 0 38 0	0 0 40 8	
10	0 0 2 2 0	0 0 25 1	0 0 28 3	0 0 31 9	0 0 34 6	0 0 37 4	0 0 40 2	0 0 43 0	
20	0 0 4 6 0	0 0 50 0	0 0 56 6	0 0 63 2	0 0 70 0	0 0 76 6	0 0 83 2	0 0 89 8	
30	0 0 6 8 0	0 0 75 0	0 0 84 0	0 0 93 0	0 0 102 0	0 0 111 0	0 0 120 0	0 0 129 0	
40	0 0 9 0 0	0 0 100 0	0 0 112 0	0 0 124 0	0 0 136 0	0 0 148 0	0 0 160 0	0 0 172 0	
50	0 0 11 2 0	0 0 125 0	0 0 140 0	0 0 152 0	0 0 164 0	0 0 176 0	0 0 188 0	0 0 200 0	
60	0 0 13 4 0	0 0 150 0	0 0 168 0	0 0 180 0	0 0 192 0	0 0 204 0	0 0 216 0	0 0 228 0	
70	0 0 15 6 0	0 0 175 0	0 0 196 0	0 0 208 0	0 0 220 0	0 0 232 0	0 0 244 0	0 0 256 0	
80	0 0 17 8 0	0 0 200 0	0 0 224 0	0 0 236 0	0 0 248 0	0 0 260 0	0 0 272 0	0 0 284 0	
90	0 0 20 0 0	0 0 225 0	0 0 252 0	0 0 264 0	0 0 276 0	0 0 288 0	0 0 300 0	0 0 312 0	
100	0 0 22 2 0	0 0 250 0	0 0 280 0	0 0 292 0	0 0 304 0	0 0 316 0	0 0 328 0	0 0 340 0	
200	0 0 44 4 0	0 0 500 0	0 0 560 0	0 0 620 0	0 0 680 0	0 0 740 0	0 0 800 0	0 0 860 0	
300	0 0 66 6 0	0 0 750 0	0 0 840 0	0 0 930 0	0 0 1020 0	0 0 1110 0	0 0 1200 0	0 0 1290 0	
400	0 0 88 8 0	0 0 1000 0	0 0 1120 0	0 0 1240 0	0 0 1360 0	0 0 1480 0	0 0 1600 0	0 0 1720 0	
500	0 0 111 0 0	0 0 1250 0	0 0 1400 0	0 0 1520 0	0 0 1640 0	0 0 1760 0	0 0 1880 0	0 0 2000 0	
1000	0 0 222 0 0	0 0 2500 0	0 0 2800 0	0 0 3120 0	0 0 3440 0	0 0 3760 0	0 0 4080 0	0 0 4400 0	

For

For Nine Months.

L. at 2 per cent.	2½ per cent.		3 per cent.		3½ per cent.		4 per cent.		4½ per cent.		5 per cent.		6 per cent.	
	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0

For Twelve Months, or one Year.

Tables of INTEREST.

441

For Twelve Months, or One Year.

L. at	2 per cent.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	4½ per cent.	5 per cent.	6 per cent.	
l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.	l. s.	d. f.
1	0 0 43	0 0 60	0 0 77	0 0 92	0 0 103	0 0 113	0 1 00	0 1 21	
2	0 0 86	0 0 120	0 0 154	0 0 184	0 0 216	0 0 245	0 1 20	0 2 42	
3	0 0 129	0 0 180	0 0 231	0 0 276	0 0 327	0 0 374	0 2 00	0 3 23	
4	0 0 172	0 0 240	0 0 308	0 0 368	0 0 434	0 0 497	0 2 40	0 4 04	
5	0 0 215	0 0 300	0 0 385	0 0 456	0 0 532	0 0 605	0 3 18	0 4 45	
6	0 0 258	0 0 360	0 0 462	0 0 544	0 0 630	0 0 713	0 3 56	0 5 26	
7	0 0 301	0 0 420	0 0 544	0 0 640	0 0 736	0 0 829	0 4 34	0 6 07	
8	0 0 344	0 0 480	0 0 626	0 0 736	0 0 842	0 0 945	0 5 12	0 6 48	
9	0 0 387	0 0 540	0 0 708	0 0 824	0 0 940	0 1 041	0 5 50	0 7 29	
10	0 0 430	0 0 600	0 0 790	0 0 912	0 1 064	0 1 155	0 6 28	0 8 10	
20	0 0 860	0 0 1200	0 0 1584	0 0 1968	0 0 2352	0 0 2736	0 1 16	0 16 40	
30	0 0 1290	0 0 1800	0 0 2376	0 0 2952	0 0 3528	0 0 4104	0 1 44	0 25 20	
40	0 0 1720	0 0 2400	0 0 3168	0 0 3840	0 0 4512	0 0 5184	0 2 12	0 34 00	
50	0 0 2150	0 0 3000	0 0 3960	0 0 4752	0 0 5544	0 0 6336	0 2 50	0 42 40	
60	0 0 2580	0 0 3600	0 0 4752	0 0 5664	0 0 6552	0 0 7440	0 3 28	0 51 20	
70	0 0 3010	0 0 4200	0 0 5544	0 0 6624	0 0 7696	0 0 8768	0 4 06	0 60 00	
80	0 0 3440	0 0 4800	0 0 6336	0 0 7632	0 0 8800	0 0 9904	0 4 44	0 68 40	
90	0 0 3870	0 0 5400	0 0 7128	0 0 8544	0 0 9856	0 1 1104	0 5 22	0 77 20	
100	0 0 4300	0 0 6000	0 0 7920	0 0 9456	0 1 0960	0 1 2208	0 6 00	0 86 00	
200	0 0 8600	0 0 12000	0 0 15840	0 0 19680	0 0 23520	0 0 27360	0 1 16	0 16 40	
300	0 0 12900	0 0 18000	0 0 23760	0 0 29520	0 0 35280	0 0 41040	0 1 44	0 25 20	
400	0 0 17200	0 0 24000	0 0 31680	0 0 38400	0 0 45120	0 0 51840	0 2 12	0 34 00	
500	0 0 21500	0 0 30000	0 0 39600	0 0 47520	0 0 55440	0 0 63360	0 2 50	0 42 40	
1000	0 0 43000	0 0 60000	0 0 79200	0 0 94560	0 0 109600	0 0 122080	0 3 28	0 51 20	

For

A TABLE for the more easy reckoning of Salaries and Wages.

per Year.						per Day.					
l. s. d. f. 100 pds.						l. s. d. f. 100 pds.					
1 Mill. is	2739	14	6	0	99	900 is	2	9	3	3	12
900	2465	15	0	3	29	800	2	3	10	0	11
800	2191	15	7	1	59	700	1	18	4	1	10
700	1917	16	1	3	89	600	1	12	10	2	8
600	1643	16	8	2	19	500	1	7	4	3	7
500	1369	17	3	0	49	400	1	1	11	0	5
400	1095	17	9	2	79	300	0	16	5	1	4
300	821	18	4	1	9	200	0	10	11	2	3
200	547	18	10	3	40	100	0	5	5	3	1
100	273	19	5	1	70	90	0	4	11	0	7
90	246	11	6	0	32	80	0	4	4	2	4
80	219	3	6	0	96	70	0	3	10	0	11
70	191	15	7	1	59	60	0	3	3	1	8
60	164	7	8	0	22	50	0	2	8	3	5
50	136	19	8	2	85	40	0	2	2	1	2
40	109	11	9	1	48	30	0	1	7	2	9
30	82	3	10	0	11	20	0	1	1	0	6
20	54	15	10	2	74	10	0	0	6	2	3
10	27	7	11	1	37	9	0	0	5	3	6
9	24	13	1	3	23	8	0	0	5	1	4
8	21	18	4	1	10	7	0	0	4	2	4
7	19	3	6	2	96	6	0	0	3	3	7
6	16	8	9	0	82	5	0	0	3	1	15
5	13	13	11	2	68	4	0	0	2	2	5
4	10	19	2	0	55	3	0	0	1	3	8
3	8	4	4	2	41	2	0	0	1	1	2
2	5	9	7	0	27	1	0	0	0	2	6
1	2	14	9	2	14						

The TABLE explained.

The foregoing Table shews what any Salary, from one Million a Year to one Pound a Year comes to a Day.

EXAMPLE.

Suppose a Nobleman has 70000 *l.* per Year, what is his Income per Day?

Look for 70,000 *l.* and against it you will find

191 *l.* 15 *s.* 7 *d.* 1 *f.* which is his daily Income.

To cast up Salaries and Wages for any Number of Days.

RULE.

Multiply the yearly Income by the Number of Days, and collect the Product out of the Table; it will give an Answer to the Question. See the following Examples.

What will 5 Days Salary amount to at 92 *l.* per Annum.

Multiply 92 *l.* per Annum
By 5 Days.

Collect 460 out of the Table.

400 comes to 1 *l.* 1 *s.* 11 *d.*

60 comes to 0 3 3 $\frac{1}{4}$ added

1 5 2 $\frac{1}{4}$

EXAM.

EXAMPLE of WAGES.

What will a Servant's Wages come to for 29 Days, at 7*l.* a Year?

Multiply 7*l.* a Year
By 29 Days.

Collect this 203 out of the Table.

200 comes to 10*s.* 11*d.* $\frac{3}{4}$

3 comes to 1 $\frac{3}{4}$

11 1 $\frac{3}{4}$ the Answer.



Some General Things proper to be known and remember'd.

A Ream of Paper is 20 Quires, a Quire of Paper 24 Sheets.

A Bale of Paper, 10 Reams.

A Roll of Parchment, 15 Dozen or 60 Skins.

A Dicker of Hides, 10 Skins.

A Load of Timber unhewed, 40 Feet.

A Chaldron of Coals, 36 Bushels.

A Hogshead of Wine, 63 Gallons.

Ditto of Beer, 54 Gallons.

A Barrel of Beer, 36 Gallons.

Ditto of Ale, 32 Gallons.

A Ton of Wine 252 Gallons; Oil of *Greenland* 252 Gallons; and Sweet Oil of *Genoa* 236 Gallons.

A Ton in Weight is 23 Cwt. of Iron, &c. but of Lead there is but 19 Cwt. and a half, called a Soder or Sother, which is 2184 lb.

A Tod of Wool, 28 Pounds.

A Pack of ditto, 240 Pounds.

A Palm or Hand is 4 Inches.

A Foot, 12 Inches.

A Yard, three Feet.

A Pole or Perch, is five Yards and a half.

A Furlong is 40 Perches.

A Mile is eight Furlongs.

An Acre of Land is 40 Poles or Perches in Length, and four in Breadth.

A Pipe or Butt, is 120 Gallons.

A Quintal

A Quintal or Kintal, is one hundred Weight.

A Truss of Hay, 56 Pounds; and a Load of ditto, 39 Trusses.

Note, New Hay in *June* and *August* ought to be 60 Pounds to the Truss, as per Statute of 2d of *William* and *Mary*.

Ancho of Brandy is 10 Gallons.

Aume of *Rhenish* Wine is 42 Gallons.

Angel, an old Coin of 10s. Value.

Bit, a Piece of Coin current at *Barbadoes*, *Virginia*, &c. Value Seven-pence Half-penny Sterling.

Bottomry is the borrowing Money on the Bottom of a Ship, for which great Interest is paid, as 30, 40, or 50 per Cent.

Cocker, a Custom-House Warrant to a Merchant on Entry of his Goods, testifying the Duty paid.

Crusado, a Piece of German Coin 6s. 2d. in *Portugal* 2s. 10d.

Debenture, a Custom-House Writing certifying the Drawback to be due.

Ditto, an *Italian* Word used by Merchants signifying the same.

Doit, the 11th Part of a Stiver in *Holland*.

Dollar, a *Spanish* Coin, Value 4s. 6d.

Frail of Raisins, about 75 lb.

Guild, a Company or Society of Men incorporated.

Hansel, *i. e.* Handsale, Money received upon the first Sale of Goods.

Ingot, an uncertain Quantity of Gold or Silver in Bullion.

Millree, in *Portugal*, 1000 Rees, about 6s. 8d. Sterling.

Neap Tides, the Tides at Quarter Moon, which are not so high or swift as at the New or Full Moon.

Noble, an old Coin, Value 6s. 8d.

Noting a Bill, is the Notary's protesting against the Person drawn upon, for his refusing to accept to pay it.

F I N I S.



Elizabeth Jackson
has wrote God give her
grace to look but at
Susanna Cary Tho
Humphreys gives a leaf
before her God no
Susan Cary thou art
my choice with heart
and ~~voice~~ voice I do
declare the same If thou
art mine then I will
be thine for ever of
Love I care

Thomson

Humphrey

June the 16th 1875

[Faint handwritten notes or signatures]

W. H. Smith

Thomas

Still

200
45 November

74